SAUDI ARABIAN INDUSTRIES CORP'N.
122 E-64th St. N.Y. (21.)

N.Y.C. REGENT 7-5-7711. Telephone Collect.

Mr. Robert Morris Kerr

WOODLEY 8481

4831 36th N.W.

Kidd, Philipp C.
Arabian-American Oil Co
340 Rhoreham Bldg.
Washington, D. C.

Di. 8043

Rob

Henderson

Lucille Erdmann
Re 2585
ex 208

C & D. 178732 Erdman

Persian Gulf

Acc.

Address to Dhahran Fishing Club Sun July 26,1948

"Fishes of Ras Tanura & Bahrain on the Persian Gulf and notes on a collection from Jidda on the Red Sea"

Preserved specimens on display

1 Eulamia black fin shark from Jidda market
2 Hippocampus sea horse Muharraq,Bahrain Is.
3 Arothron black puffer Red Sea
4 Arothron puffer Red Sea
5 2 Hydrophis poisonous sea snakes Ras Tanura,fi r
6 Scopaena scorpion fish Ras Tanura
7 Dussumiera dwarf round herring Ras Tanura
8 Tylosurus bill fish Ras Tanura
9 Petrometopon sea bass Ras Tanura
10 sea turtle baby Ras Tanura
11 Sparus datnia broad porgy Ras Tanura
12 Echeneis naucrates shark sucker Ras Tanura
13 Caranx scad Ras Tanura
14 Sardinella sardine Ras Tanura
15 Gerres yg mojarra Ras Tanura
16 Crenidens crenidens brown tooth porgy Ras Tanura
17 Arius thalassinus sea cat fish Ra Tanura Tanura buoy 7

Dear Friends and fishermen:

I have brought with me some denizens of the deep because seeing is believing and they may raise questions in your minds,

The peculiar conditions of the Gulf are a subje ct ct for an evening in themselves. I will consider a few facts briefly. Cold winter winds from the north have been known to drop Temperatures of air as low as 30 degrees F. Old timers

have seen dead hamoors drift up on the beach during these cold spells and other fish as well.This of course raises temporary havoc with the fish population. In summer the water reaches as high as 98 degrees F. at Bahrain Id. according to Anton Mohr "Den Persiske Bukt". The salinity count is very high in summer due to excessive evaporation. These rigorous climatic conditions seriously limit the fauna and flora in the Gulf.The number of species of sea weeds corals,fish, and molluscs is a ½ to one third the species in the Gulf of Oman. Two species of small corals are found at Ras Tanura,the branch coral which grows 2 or possibly 3 feet high., and the white greyish brain coral round and about 12 inches in diameter. This limited coral reef habitat limits the number of highly colored reef fishes to be found . The tides are considerable 5 to 7 feet at Ras Tanura which makes a noticeable differences on the long flat shallow areas in the Gulf. The fish supply is better than one might expect, and I beleve it to be better than adequate at the present time.

Concerning my visit to the Red Sea at Jidda I had a very successful trip. I received excellent cooperation and Housing from the folks at Aramco House in Jidda. In particular I want to mention the great help rendered to me by Hussein Tahir Abdul Azziz,chauffeur for ARAMCO,in all my collecting and in securing market Fish for me even when I was sick.

The Red Sea is studded with extensive coral reefs.that come within a foot of the surface. There is almost no tide at Jidda. 2.6 feet is the greatest tide recorded by theBechtel Co since January 1948. Because of extensive reefs there are a great number of brightly colored reef fishes most of which I got with powdered cube root, a rotenone poison.

Fishing spots in the immediate area of Al Khobar are limited because of extensive areas of shallow water with mud and sand bottom. Chaschuse channel and Id a sand bar that bears at low tide,are good fishing spots according to nati ve fishermen where chanad can be caught in season. Najwa bank has coral banks and is 8 miles SE of Ras Tanura Pt. It is good for trolling and trap and hook and line fishing. East Pier at Ras Tanura is good for trolling and rod fishing;buoy 7 is good bottom fishing for grouper and sea catfihsh Ras Kaliya 20 miles north of Ras Tanura is good for Hamoor and black grouper near a rocky area near shore. This about covers the fishing areas within reach of Al Khobar and Rast Tanura . There is Half Moon Bay soth Of Al Khobar where there is said to be good spear fishing in one rocky spot. Bahrain has good fishing areas but the best ones are not near by. Miller trolling jigs are good and also silver spoons. Shrimp,halfbeaks, cut fish ,cuttle fish,and sardines are all good bait for fishing.

Game fish in the Gulf consist of the v following general fishes: groupers,chanads,tunas,marlins,thulahs,Jack fish,cobias, barracuda,bill fish,and sharks. I have collected about 115 fish from the Persian Gulf and 115 fish from Jidda , The Red Sea has good trolling fishing and good oppportunities for under water spear fishing off the reefs.

Question and answer period covering the habits and occurence of certain fishes: sting rays,saw fish,sharks,sea snakes,jellyfish, scorpion fish,sawfi sunaifi,etc. The young boys showed a great deal of interest by asking many intelligent questions. And I have reason to believe the evening was a success.

Fishing methods used on the fish survey

1. native dried berry poison(kim) bought in Bahrain but not yet tried but I saw that it worked in Bahrain Myself.
2. Cubé root (rotenone poison) 3. Creosole (not used)

5 minnow seines

6 shore seines

7 native wire traps "gerrurgir"

8 native palm stake nets visited and patronized

9 large wirev fish traps

10 eel pots

11 hook and line

12 set line

13 trolling line miller jigs and silver spoons

14 night light fishing with hoop and dip net from boatside

12 spearring at night with flashlight & dip net at Jidda and in Tarut Bay.

Preservation

1. Fish preserved in formalin and water 5 parts water to 9 parts water to one part liuid commercial formalin.
2. Crustaceans, molluscs, snakes, frogs, and insects in 70% grain alcohol
3. dried shells and skeletons

Donald S. Erdman

INTRODUCTION

From March to August 1948, I was the guest of the Arabian American Oil Company, better known as ARAMCO, at Dhahran, Saudi Arabia. The purpose of my visit was to aid in a fish survey of the waters of the Persian Gulf adjacent to Ras Tanura. As a member of the staff of the Smithsonian Institution part of my work consisted of collecting fishes and other marine animals and plants for the U. S. National Museum.

ARAMCO was interested in the local fish supply in order to supplement the food of company employees. An experienced fisherman was hired by the company to direct the survey, and the cooperation of regular employees was voluntarily offered.

Practical results of the survey were as follows:

1. The construction of a fish pier and fresh fish processing plant at Ras Tanura Point.
2. Contacts with Arab fishermen to sell their produce to the Company.
3. A brief biological survey to determine the kinds and numbers of fish available.

An Arab launch, "Palestine" was used as the survey vessel with a rowboat. Another boat, the "Tarut" was used for part of the survey to obtain records on fish caught by trolling.

In addition to the generous hospitality of ARAMCO during my stay in Arabia, I wish to express appreciation to all the people who helped me directly or indirectly in my work, not only in the line of duty but often far beyond the call of duty. Without the help of these friends both Arab and American my trip could not have been a success.

FISHING IN ARABIA

The Persian Gulf and Red Seas can in summer be the hottest seas in the world. Both seas are surrounded by vast areas of sun baked desert, and their weather is controlled by the surrounding land. In August 1948, I recorded an open water temperature of 39°C (approx. 104°F) near Chaschuse Island in the Persian Gulf, about 2 miles from the mainland of Saudi Arabia. For a minute or so the water was uncomfortably hot to wade in. Even so, small fish were numerous in the waters around the island and in some ponds in the island which were connected with the Gulf.

The shamal (north wind) is the prevailing wind in the northern Persian Gulf. For days at a time especially in May or June, the wind keeps the sea in a constant froth, and visibility is cut down by brown dust as by a dense fog.

The Red Sea also has its dust storms, usually from the south east at Jidda. When I was in Jidda in July the weather was clear, hot, and humid. It was calm in the morning, with a steady northwest breeze arising in the afternoon which usually continued until sunset.

In winter, the waters of the Northern Persian Gulf become cold, since air temperatures have been known to drop near freezing and the water is so shallow. Veteran employees of ARAMCO have told me that many fishes drift up dead on the shores during these very cold spells. The Red Sea, however, is never subjected to such extremes in temperature.

Tides at Ras Tanura vary between 5 and 7 feet. The very gradual descent of the shore line makes the tides even more noticeable. One night on the boat, in Tarut Bay, I woke up with a sore neck. When I scrambled out on deck, I saw the stern was high and dry on a sand bar. The next morning the nearest land was 1/2 mile

away.

Tidal currents at Ras Tanura and in Tarut Bay are swift averaging 4 knots or more in certain places. In some spots the current is so swift that it is unsafe to land a rowboat on an island where there are bits of coral around. When the current is swift it will make a boat at anchor lie in a cross sea, even when the wind is very strong. The period of slack water at ebb and at flood appeared to be very short, which is disadvantage for night light fishing and hook and line fishing.

I was a week in Jidda before I could detect any tidal change in the Red Sea. One evening, I noticed that a small mud pool was connected with an inlet; whereas until then it had been separated for days by a few inches of beach Records of the International Bechtel Company show an average tidal change of 6 inches over a six month period with a high tide in January of 2.6 feet.

Bottom characteristics.—The bottom of Tarut Bay, Persian Gulf, varies between bottomless gray clay sand, regular beach sand, and hard coral rock with scattered corals. There are two species of coral in evidence, a branch coral (2 or 3 feet high) and a small brain coral not more than 2 or 3 feet in diameter. The coral grows below the low water mark, and true coral reefs do not exist near Ras Tanura or Bahrain.

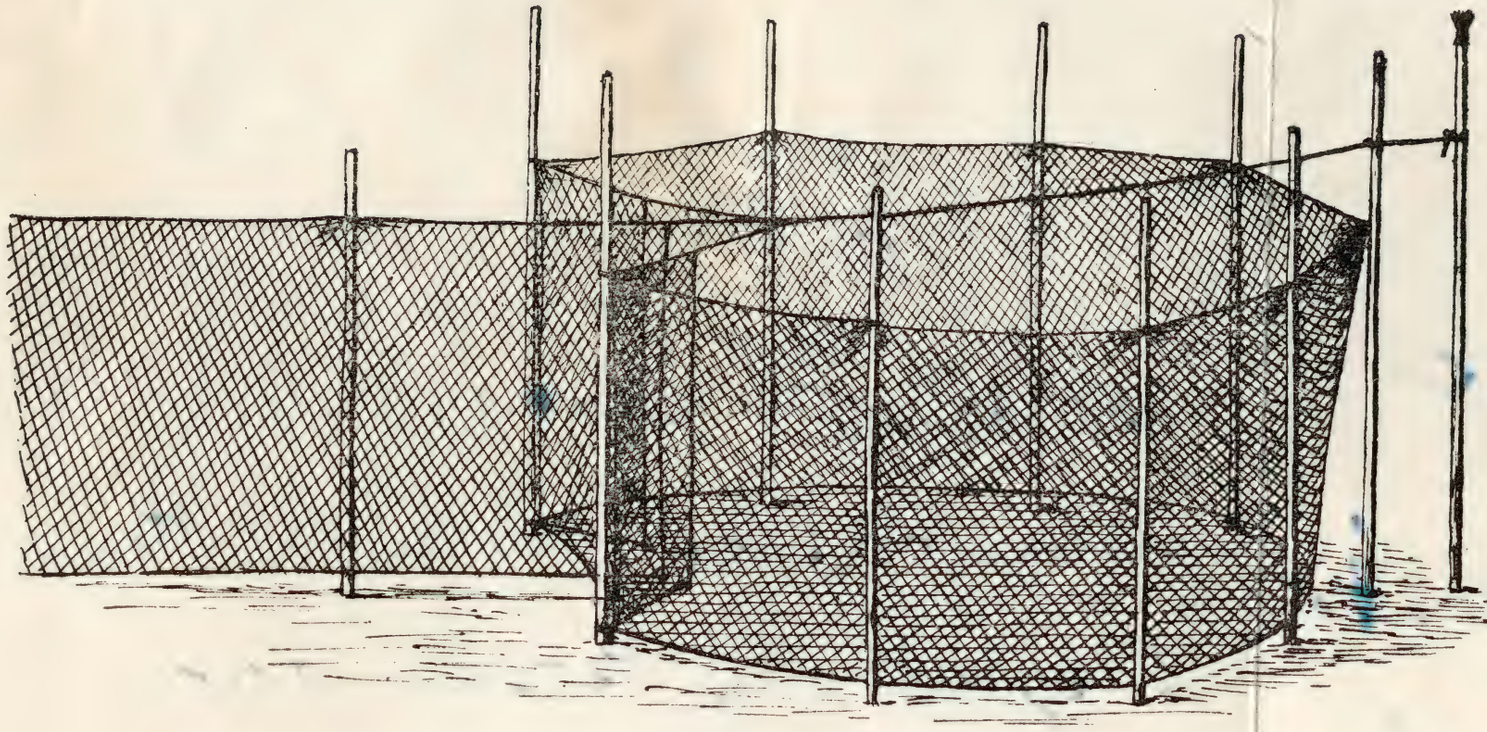
At Jidda, Red Sea there are a series of two long coral reefs that continue parallel along the coast for several miles. The reefs are separated by an expanse of deep water. Jidda harbor is studded with many individual coral heads that came within a foot of the surface. The Arab sailors somehow know where the reefs are at night and can sail safely by them in the dark.

Many of the corals in the Red Sea are bright pink and green and the reefs abound with many fishes colored like jewels. The reefs are ideal for the sport

H. Blegrad

Dansk Biologisk
station
Charlottenlund Slot
Charlottenlund

Stake-net: commonly used in
Denmark; and used by H.
Blegrad in Persian Gulf.
Used in soft mud bottom



of spear fishing or the use of an observation mask. They are also ideal for collecting fishes with the use of rotenone poison. At the edge of the offshore reefs, the water deepens into a beautiful rich sea blue, and large fishes cruise leisurely about at the reefs edge.

At Sharm Ubhar about 10 miles north of Jidda and arm of the sea enters the coast line and the small bay is surrounded by massive brown coral rock on either side. Each coral rock is a history book of the corals which have lived in the distant and the more recent past. Most of the bottom is underlaid with sharp coral rock, and the beautiful Tridachna lies cemented to the bottom; its shells are open showing an indigo mantle which can turn to bright yellow in an instant. This rugged bivalve will close on any unwary passer by.

South of Jidda there are areas of extensive mud flats behind the reefs. These mud flats are inhabited by crabs and small fishes such as gobies and killyfishes (Aphanius dispar). The mud is underlaid by sharp coral so that wading barefoot is dangerous.

Arab fishermen:

Without the Arab fishermen the Persian Gulf and Red Sea would lose flavor. To our skipper and crew their feet were a second pair of hands. Often our shipper would operate the wheel with his feet. One member of the crew spent most of his spare time making rope with his hands and feet.

Many Persian Gulf fishermen are pearl divers at one time during their lives, so swimming and diving is an integral part of fishing. Commonly used in Tarut Bay and Bahrain are hand made wire fish traps which are set on bottom and recovered by a diver. Lines and floats are unheard of because of extra expense and mistrust of one's neighbor. The traps are set in a line without regard to landmarks, of which there are very few. Our skipper set six trap at Najwa bank eight miles S.W. of Ras Tanura, and because of a shamal we could not pick them

up for a week. When we returned and dropped anchor, he recovered four traps in a half hour and said the other two were stolen. Except for one stationary marker on Najwa shoal over half a mile distant which bares at low tide, there were no points of reference - just water everywhere and the land extremely hazy in the distance.

In addition to fishing with pots, palm stake traps are popular in the Tarut Bay and Bahrain area. The strong stems of large date palm leaves are shred of their leaflets and the ends are stuck in the muck sand, one stem lasked closely to the next, until a whole trap is formed. The traps operate on the principle that fish swim inshore with the high tide and go out when the tide ebbs. At high tide the tops of the palm stakes are almost under water, but at low tide the stakes are readily visible. In Tarut Bay the traps are arranged in a wide "V", the open part toward the shore. At the angle of the V is a rounded trap box where the fish are recovered at low tide. To recover the fish from the trap the fisherman gets right in with the fish and wades around after them with a short, square seine with two wooden handles.

In Bahrain the traps have a single leader perpendicular to the shore, and they are probably more effective in catching fishes swimming in schools parallel to the shore.

Stationary floating pound nets are used to a limited extent, but the palm stakes have their advantages. Cotton twine even if it were treated would not last long in the sunny, hot, salty Persian Gulf, but palm stakes seem to have a high resistance to rot in this water.

Shore seines, throw nets or cast nets, hook and line are also used, but since these methods are world wide they need no comment. The cast nets are most effective in turbid water where the fish cannot see so easily. Shore seines are not common because sand area without coral is limited or the seine would sink in the prevailing muck sand.

Around Jidda one sees a fisherman wading in after the fish with a cast net, with all his clothes ~~on the beach.~~ wrapped around his head. and in this way he runs no risk of losing them on the beach.

Hospitality is the byword in all Arabia, land or sea. One day during a blustery shamal we visited a stake net fisherman to purchase bait. We were invited aboard by our host to pass the time of day before discussing business. We were offered fresh roasted fish and shrimp cooked over a wood fire in a small sand box on deck. A rough awning of battered canvass was our shelter from the wind.

no ¶ Bait was nowhere in sight. In due time we found out that the bait consisting of mole lobsters and crabs were living over the ships side in grass bags.

Another day I went fishing with an Arab fisherman in Bahrain. He propelled his 20 foot boat by means of a long pole with an iron point and barb at one end. The bottom of Manama Bay varied from grass on grey muck sand, to gravel sand and coral rock. Live coral growth was not abundant. Every now and then he would stop, dive over and pick up a fish trap which would contain several small porgies and Siganus siganus "sawfee sunaifee". For bait he pounded "hashish", a kind of green sea lettuce similar to Ulva, with stones and made a sort of ball which he placed in the traps. "Hashish" is supposed to be good bait for "sawfee", which is 5 to 8 inches in length and is an excellent pan fish. Later on he picked up some dead porgies on the bottom, but they were still fresh. "Sim" a native fish poison was the cause of their deaths.

Enthusiasm and skill for hook and line fishing has no limits in Arabia. One launch crew man would squat each evening on the after rail, cast his line far out, and barely move the line back and forth between his thumb and forefinger. He averaged about two fish every five minutes during the time he fished and he

never failed to catch enough for his supper.

A disconcerting sight on the pier at Ras Tanura is to watch an old Arab dressed in rags with a small hook and handline outfish an American, right next to him, with a ponderous surf casting rod and highly polished reel.

With these threadlike lines and tiny hooks the Arabs catch the halfbeak or "sils" which is good bait for larger fish and is also excellent to eat.

Fish drying is a widely practiced art. Our crew would often split and dry fish, fish heads, and cuttle fish in the rigging or on the deck roof. Salt was seldom used and the drying was accomplished by direct sunlight. Commercial dried fish at Manama Pier on Bahrain Id. are as pliable as wood shingles but slightly tougher. Even so I saw small boys walking nonchalantly along chewing on dried fish as though it were candy.

Fishing for the "subaitee" Sparus cuvierei, a large porgy, is an art in a class by itself. This fish is an ordinary porgy with individual habits. It can be observed particularly around piers. If you cast bread upon the waters, large subaitee appear from the depths to take the bread just like tame carp, and in this manner they will take just about anything with one fatal exception - they are allergic to fish hooks.

Only a person with skill and experience can catch a subaitee by hook, and the following is the way I have observed it. A small Arab boy was fishing one morning off the bridge between ~~Muharraq~~ Muharraq and Bahrain. He had a basket full of small fishes and a thin cotton line and a small hook. The tide was rushing in under the bridge, and subaitee were darting around barely keeping up with the current. The boy carefully baited his hook so that all of it was buried in fish, then he would throw a large handfull of fishes and fish pieces into the water and would soon after cast the baited hook in the center of the floating pieces. Instantly several subaitee rush up to the surface to devour every piece, and nearly always clean the hook or shy away from it altogether. But after about

10 such casts without success a subaitee ran off with the hook. The Arab boy was quickly over the bridge railing and climbing down the rocks to the waters edge, and carefully pulled the fish towards the bridge capturing it with skill alone.

"Subaitee" can be speared in shallow water when the tide is near the flood, usually early in the morning or late in the evening.

As evidence of the varied appetite of the subaitee, I found a 4 foot piece of goat skin inside a 5 pound fish.

Trolling with feathers and jigs is good sport both in the Persian Gulf and the Red Sea. The king mackerel or "chanad" Scomberomorus commersonii was our most common catch during April and May. Barracuda, jacks, and groupers may be caught also in this way. Blue fin tuna are caught by rod and reel at Ras Tanura. Large schools of bonito or small tuna were seen cutting the surface around Ras Tanura during May and June. About three miles offshore one day, I saw several marlin jumping out of the water. They have also been reported by other sports fishermen.

Fishing with a 100 watt bulb over the side at night with a ~~carb~~ crab net or hoop net was quite successful. A saga of sea life would pass by the light each night. Fishes, sea snakes, crabs, mole lobsters, shrimp, and sea worms and more occasionally a cuttlefish or squid would appear under the light. Most abundent among the fishes were round herrings, sardines, halfbeaks, silversides and billfish.

Sea snakes (Hydrophidae) between one and three feet in length often came to our light in May and June. They slowly wriggle their way to the surface from the bottom as a snake goes through grass, only more leisurely. On reaching the surface the snake gulps air and always descends very rapidly. The period of time that the snake has its head at the surface of the water was always a very short time.

The snakes are bottom feeders as is indicated by a bottom dwelling goby which is found in the snake stomachs. All sea snakes are poisonous and the body is black banded on white with a flattened rounded tail. The snakes, however, do not attack bathers, and on land they are very sluggish.

The mole lobster Thenus orientalis is white in color and 10 to 12 inches in length swims at the surface at night backwards with rythmic flips of the abdomen. We caught only females with bright vermilion eggs at the surface during May and June. "Mu al rubyan" is the native name meaning mother of shrimp. The tail meat of these mole lobsters is very sweet and is more tasty and less tough than the spiny lobster. We caught them with crab nets and would flip them up on the deck roof where they would rattle around until we grabbed them.

Female crabs with grey eggs were common at the surface but were wary of the light and net and could change direction abruptly. One evening we caught a snapping shrimp at the surface. The snapping shrimp lives in holes of coral rock on the bottom.

One night large schools of the three spined fool fish Triacanthus indicus came to the light. The crew had a riotous time scooping them up on deck. Over 100 fish between 8" and 10" in length were caught in an hour's time in this way.

Stuart Campbell of the Jidda office of ARAMCO told me a story about the "bull dozer fish" and the "watch dog", which checked with my observations in Tarut Bay. The "Bulldozer fish" is a burrowing mole like shrimp which excavates and burrows 2 feet or more below the low tide mark in hard muck sand. Once every minute or so, out rushes the shrimp from his burrow showing a pile of sand and pushes it at least six inches away from the entrance to the burrow, then disappears immediately into the burrow backwards, and out again a minute or so later with another load. The "watch dog" may be a blenny or more usually a large striped goby (the same kind the sea snakes like) that sits by the side of the burrow

Cryptocentrus pavovinoides

apparently oblivious to the toil of his house mate. But the second danger threatens, the "watch dog" plunges into the burrow to appear later when the scene is clear. Once I watched two "bulldozers" working out of their burrows at right angles to each other in about 4 feet of water. One "bulldozer" was dumping his load into the right of way of the other bulldozer. They were both so busy bringing out loards of ~~sand~~ sand, that they did not realize what was happening. Each hole had its "watch dog", a blenny and a goby who sat idly by during this frenzied activity.

One night we were seining along a sand beach near Ras Tanura, and Swede Morrill, a husky 6 footer, stepped on something that gave him an agonizing pain in his foot. The stinging pain worked up into the groin and lasted about one half hour. The cause of this incident was a little scorpion fish 1-1/2 inches long which is called "Faryalah" by the Arabs and is feared and respected by them. Later I watched one wriggle itself down into the wet sand with its front dorsal spines erect, and its pectoral fins spread to give itself firm support. The Arabs say these fishes do not exceed 6 or 8 inches in length. Our specimens compare closely with Prosopodasys dracaena described in Day's "~~Fishes~~ Fishes of Malabar".

Sea Weeds:

As the land has its seasons so does the sea. Rooted beds of gulf weed were abundant around Zaal Id., Tarut Bay, during April and May 1948. At low tide the brown tops would lie limply at the surface and would be impossible to row through. During a visit to the same spot on June 1st, not a single piece of gulf weed was in sight. At first I thought I was in the wrong area but eventually I could discern small black root like structures on the bare coral rock bottom. This a whole gulf weed habitat was wiped out almost over night. These gulf weed areas were favorable for the use of rotenone poison in collecting small fishes. During the latter half of May floating gulf weed was abundant in Tarut Bay.

The incoming tide was the best time to collect larval fishes from underneath

clumps of floating gulf weed. The most common fishes to be found under the gulf weed were small young blennies, belonging to the genus Petroscirtes.

In the clay sand bottom of Tarut Bay grew a short leafed type of eel grass, 4 or 5 inches in height, which spread itself by runners and is a true flowering plant with true roots.

Also on clay sand or coral rock bottom there was a dark brown alga with thin branching "leaves". This alga was rather limp and soft to the touch. Small grey snails were found in abundance with this type of weed.

In Manama Harbor, Bahrain Id., a type of sea lettuce similar to Ulva grew thickly in the shallow water near shore. Also a small mangrove grows on the flats of a tidal inlet just south of Manama.

In the Red Sea at Jidda is a dark brown calcareous alga that grows firmly attached to the coral reef rocks. On the outer edge of a shore reef a wide band of this alga 200 or more feet wide grows along the reef in a foot to two feet of water.

Jellyfish (Coelenterata)

Any mention of the Persian Gulf in summer without jellyfish would be incomplete. I saw myriads of large white jellyfish eight inches to a foot in diameter near Al Khabar one day in June. The belt stretched north and south as far as the eye could see and was over 100 feet wide. The water was just about solid with jellyfish. On either side of the jellyfish belt there were more individual jellyfish going by our boat than one could count. This species is a solid white mushroom medusa with three to four inch egg masses hanging down below and no long tentacles. They are efficient swimmers for I have seen them bump against dock pilings and simply turn around and swim off without any difficulty.

A transparent Aurelia type of jellyfish with 4 pink ring-like masses in the center was also very abundant in Tarut Bay. All non-poisonous jellyfish are

called "fuqlool" in Bahrain.

The "lwaithy" is a transparent small poisonous jellyfish with a dark red cross and short reddish tentacles around the edge. The "lwaithy" was common especially at night, and we caught a trammel net full of them one evening.

The "dool", a small bell shaped jellyfish of opaque light tan color has very long tentacles which are almost colorless. A "dool" with a bell of two or three inches in diameter may have tentacles two or three feet long. The "dool" has the habit of swimming at any level in the water, and is often one or more feet below the surface. In other words it is easy to be stung by a "dool" without even seeing it. Pearl divers dread the "dool" and a tentacle touching a divers eye could conceivably cause blindness. At Ras Tanura the "dool" is most abundant about one hour before flood tide, a good time not to be swimming or diving.

I observed association of fishes with a medusa only once at Ras Tanura. Two species of small jack fishes Caranx were swimming around a six inch white jellyfish.

No Portugese-man-o-war Physalia were seen, and since these animals are propelled by wind it is unlikely that they occur in the northern section of the Persian Gulf where the prevailing winds are northerly.

A free swimming tunicate Salpa was very common at Ras Tanura. It is oval in shape and transparent with transverse muscles which contract in pulsating movements and propell the animal through the water. A round yellowish body with a red spot is just off center inside this animal, and readily distinguishes it from any kind of jellyfish.

Mammals:

Black shark-finned porpoises and grey dolphins, Phocoena phocoena; were abundant around Ras Tanura. The dolphins would come into shallow water close to

shore in Tarut Bay especially at night. The dolphin has no dorsal fin but has a raised hump in the center of its back with small thumb like hump on top giving the appearance of a helmet. The black porpoises are white below and black on top and are usually found further offshore than the dolphins.

The strong tides and relatively deep water around Ras Tanura Point 40 feet or more in spots, may in part account for the local abundance of fish and porpoises. For example no porpoises were seen in the shallow waters between Bahrain and Al Khobar where the bottom is visible for nearly the whole journey of 15 miles.

Birds:

Sea birds were abundant at Ras Tranura during the period of April to August. Common terns, caspian terns, sooty terns, slate bellied terns, and cormorants were most numerous. There were also several species of small gulls. Large curlews and plovers were seen on the sand flats south of Al Khobar in April and again in August. I saw one osprey near Chachuse channel early in June. Caspian terns and plovers were nesting on Zâal Island during the month of May.

Flocks of terns often followed the schools of bonito and continually dove at the surface to catch small fishes.

When I was in Jidda about three weeks in July I did not see many birds-just a few small hawks around Jidda and the sea birds including terns small blue herons and small gulls with black backs. The gulls were a nuisance because they would pick up fish that we had poisoned on the reefs.

Care of boats:

Dry dock in Manama, Bahrain, is elemental (no iron ways, no winches, no boat cradles) you just sail your boat up at high tide to a section of beach allotted for that purpose just north of Manama pier. Poles are lashed on either side of the boat and are placed in the bottom so that when the tide goes out the boat may be on an even keel. Then caulking or barnacle scraping is carried on

by the crew and eventually the application of a white paint on the bottom by hand. The paint has chiefly a lime base. Raw fish oil is applied by hand plus a rag to the top sides and deck. If you romanticize your imagination, fish oil on wood has a similar effect in coloring as varnish.

About 6:00 o'clock the first morning in dry dock there was a series of "Kaif ~~Salek~~ Halek" and "Salam" and other greetings, and I realized that a person other than a member of the crew was boarding our boat. First a weird ancient box came up (possibly Pandora's) with instruments inside with which I was still unfamiliar. Next I beheld a one eyed old man replete with a dirty grey cap and gown and a dignified full beard. He was thin and gaunt and a runner up for Methuselah, but his manner was pleasant and like all Arabs he was armed with a sense of humor.

I pinched myself because I was still drowsy, but I was finally convinced I was awake in spite of what was going on. Our complaint had been that the deck leaked (a gross understatement), and here was our ship's carpenter respectfully referred to by Ahmed, our cook, as "Nakhoda" captain.

Soon our carpenter was at work with his wooden hammer, crude chisel, a coping saw, and a bowstring drill which reminded one of the apparatus used to make fires by enthusiastic boy scouts. Even caulking irons in Arabia have a different edge, sharper and narrower. Untreated cotton was used for all caulking of the deck. The carpenter would squat bare footed on the deck, his most common working pose. If a board is found with a soft spot on deck the technique is to chisel out a hole around the spot until good wood was ~~touched~~ reached. Then a new piece is cut with the coping saw to fill in the hole. Wood is scarce in Arabia so it must be conserved. With good luck a single piece of wood could last eons of time in a dhow, since the boat would continually be built around it. In fact even new dhows are pieced together like jigsaw puzzles. The lines of the boats,

however, are good.

After several mornings of industrious labor, the work of the ship carpenter was deemed finished, and the dock was greatly improved, comparatively speaking.

Living on the boat for a week in dry dock was an experience, since all my actions were noticed by passers by on the waterfront street. At first I was a little annoyed and self-conscious, but after awhile I became so accepted by passers by and visitors that life became almost humdrum.

Nearly all the Arabs I met showed one paramount virtue, that of accepting other people as they are and not being inquisitive or amused in a taunting or hostile way. In slang, they do not get in your hair. One or two exceptions stand out only because they were so few. An American living in dry dock on an Arab dhow and writing voluminous notes and pickling good fish in an evil smelling fluid would be a lot to take for anyone. Nevertheless, Arabs came and went and talked with me with no evidence of alarm. The basis of this calm attitude is their faith in God. "In sha Allah" as God wills, is on the lips of a moslem many times a day, and so the coming of myself or even the oil company to Arabia is no surprise to an Arab. Allah willed that it should be so, and it is so. Incidentally ulcers, cancer, heart disease, and insane asylums are unknown in Arabia; so don't feel too secure about your own life for yourself dear reader.

A fresh water survey:

The great oasis of Al Hasa is 50 miles inland from the Persian Gulf. The largest town is Hofūf with about 10,000 inhabitants. Here beneath the shade of over 2 million date palms are clear cool springs that well up out of the ground and flow for a mile or two as small rivers to disappear again as mysteriously as they first appeared.

The water is crystal clear and sweet tasting, even during the hot days of August. Though the air temperature was usually well over 100°F. in the middle of

the day, the highest temperature that I recorded in any of the springs was 89°F. Besides supporting an extensive agriculture of dates, rice, figs, limes, and other crops, the waters have a life of their own. Two kinds of fish, turtles, frogs, many aquatic insects, snails, leeches, and lush aquatic plants including rooted pond weeds and several kinds of algae.

The fish are the small killyfish Aphanius dispar (which is common along the coastal areas of Arabia in both fresh and salt water) and a fresh water mullet which does not exceed 5 inches in length. The killyfish are interesting because of the considerable variation of size, shape and color among individuals, which is not true of the species in salt water. The mullets have a tan color pattern above with three diffuse lengthwise stripes and white silver below. They fin rays of many of these mullets examined are crooked, but the fish were healthy and normal in all other respects. Both species of fishes are dried and salted to some extent for Arab food, and the need for the introduction of a fish that will grow to a larger size is apparent.

Because of the success of carp culture in Palestine and other countries, the carp Cyprinus carpio may prove to be a valuable introduction at Hofûf. In the event that pond culture would not be attempted at the present time, the introduction of a large cichlid, such as Tilapia galilea, to establish itself in the wild state might be a ~~good~~ better idea.

The frogs grow as large as three inches from head to tail, but they are not eaten by the Arabs because of religious prejudice. With over 2000 Americans working in Arabia a market for fresh frogs legs could be developed, and possibly the American bullfrog might live in these waters.

The turtles are a small type of painted or pond turtle, and they are another indication of the presence of protein food in the water.

The aquatic insects consist of dragon flies, whirligig beetles, giant water bugs, water boatmen, and a number of others. I did not find any crustacea such as shrimp, crabs, or daphnia. Very small crustacea, however, may be present, but I was without a microscope to look for them.

Hoffif is a walled town built of sun baked mud. Arab sentries guard each gate but Americans are admitted on business as friends today, whereas a few years ago they were unknown.

Business is transacted in the open market place where camels groan and trucks rumble on their way. Here the ancient and the modern live in apparent harmony.

We made a courtesy visit to the Emir of the Province of Al Hasa. His ancient palace was lighted with electric lights, and the guards were equipped with long sabers with decorated silver scabbards and ancient muskets. The custom of centuries persist strongly in this ancient town.

<u>looking towards the future:</u>

The long term view of this survey was to encourage further development of fisheries in the Persian Gulf. From both the biological and modern fisheries point of view, the Persian Gulf is a new area for development and study.

The skill and life time knowledge of Arab fishermen should be carefully integrated with some new methods and higher quality and more variety of materials for fishing gear. Efforts should be directed towards supplementing and stimulating Arab fishing in the Persian Gulf.

The fish fauna of the Persian Gulf waters in the area surveyed appears to be more than adequate for immediate needs. The number of fish species are few in comparison to the Red Sea or Arabian Sea, but the large number of aquatic animals other than fish such as porpoises, jellyfish, crabs shrimp, sea snakes, cuttlefish etc. is a strong indication that there is adequate food in the water for these animals to live on. Some of the fishes, such as the tuna family, are

temporary or seasonal visitors, but there is a good population of more permanent residents such as the groupers, porgies, and snappers.

The Red Sea on the other hand at Jidda has the appearance of a tropical coral reef area, with a great number of fish species, but a limited reserve of fish stock. This does not mean that the Red Sea at Jidda is a poor fishing area, but that for comparative surface area of water the Persian Gulf may potentially produce more fish than the Red Sea.

2/25/48

Data supplied to Dr Leonard P. Schultz by Rohrbaugh Corp from reliable sources

(Source: *No. 527; xx, No. 524)

Persian Gulf Area

Economic

----(*pg. 518)----fishing is another occupation on both the Red Sea and Persian Gulf coasts, but no statistics are available and detailed information is lacking---(xx pg. 127) inhabitants of Musandam peninsular and Ruus aljibal promontory are primitive fisher folk---pearls are collected from great pearl bank in South part of Gulf by diving from boats---pearl market is Manama, the capital of Bahrein Island---(xx pg. 143)---Bahrein Coasts,---many fish traps are set on northern reefs---inner harbor is usually full of native craft (xx pg. 139)---Qater Peninsula ,---small craft harbors---North and West coast of the Musandam Peninsula,---primitative Shihuh people---live on fish---migrate in Summer---contains hottest and most oppressive place in the World---cable station abandoned because of climate---(xx pg. 128)---sun dried strips of shark flesh sold in interior of Arabia---

Iraq----fresh water fish, like poultry,---exported to Palestine in refrigerated vans, particularly for Jewish markets---500 tons in 1935; 1,000 tons in 1940----very little information available on fishing methods and number of persons employed----extensive netting from boats----considerable yearly production indicated by annual fish tax receipts (xx pg. 490)---ranging from 10,000 to 20,000 pounds sterling (no tax on fish consumed by marsh tribesmen) and by Iraqi Dinar value of fish exports; 8,640 in 1937; 50,196 in 1941 (one ID = 1 lb sterling, April 1, 1932 law).

Species

(xx pg. 128)---Gulf waters are generally clear and swarm with life--abundance of sting-rays, sharks, porpoise, turtles---.

Tigris and Euphrates Freshwaters (xx pg. 204)--no trout or salmon---few catfish---spiny eal (Mastacembelus)---waters dominated by the carp family (Cyprinidae) peculiar to the region,--including "Tigris Salmon", small scaled form, which attains a weight of 300 lbs and a length of over 7 feet--also---(Acanthobrama), a bream---small minnows (i.e. Aspius. A)---loach like (genius Garra)---(mastacembelus)---two species of catfish (Macrones)---true roaches ---two species of tuny----two other carps (including Gambusia)---.

Tigris and Euphrates Lower Reaches (xx pg. 205)

Indian Shad (Hilsa)
2 Grey Mullets
Ancovy
Gar-fish
Spotted Argus-fish
(Scathophagus argus)
Mud-stripper Gobies (Boleophthalmus)
Sea Bream
Puffers
Sting-rays
Ganges Shark

Red Sea Area

Economic

--(x pg. 518)---fishing is another occupation on both the Red Sea and Persian Gulf coasts, but no statistics are available and detailed information is lacking----

Coast of Eritrea---(x pg. 115) of economic importance--are fishing (by Arabs) and salt industries---fish marketing hindered by hot climate and great diversity of species----refrigeration plant necessary for expansion--- coral reefs prevent use of drag nets---fixed nets, pots and harpoons are used-- salted shark flesh exported to East coast of Africa to Persian Gulf---shark tails and fins are dried and sent to Far East---pearl fisheries are important, especially in Dahlak Islands---.

The Yemen Coast---(x pg. 528)---fishing---profitable---chiefly from boats---Kamaran Island (x pg. 137) export trade in charcoal and dried fish--- four villages mostly populated by fishermen and families----Zubair Islands (x pg. 137) occassionally visited by Arab fishermen----Jebel Zuqar Island (x pg. 139) is used by fishermen -- in search of sharks fins, fish and turtle--

Coast of Western Aden Protectorate (x pg. 142) sandy beaches where the fish dry in the sun and native boats are built to the ancient pattern--- Maqatin (x pg. 145)---fishermen erect rough shelters---.

Coast of Eastern Aden Protectorate (xpg. 147)---fishing---chief activity inhabitants made out with hand nets or cast from small canoes--fish are dried on beaches,---transported to interior for camel fodder and manure---bediums eat fish raw or cooked--or allow fish to decompose in pits to obtain fish oil---Seihuts (x pg. 150) chief trade is in dried fish and fish oil---(x pg. 152) most of the villages are engaged in fishing--- (x pg. 427) fish, fresh or dried, less popular in Western Aden protectorate, is expecially liked in the Eastern---nearly always plentiful near coast, particularly at certain seasons--most popular in interior of the Hadhramaut states is dried shark; also Hanit or dried Tamad, pounded or cooked---small aid, called Wazif, when dried, usually plentiful and cheap, are eaten by poorer classes but are chiefly used as fodder for camels (failure of catch was factor in recent famine)---(x pg. 429) larger freshwater fish (Barbel) is caught by Jews in a Wadi, northeast of Sania---.

Aden Colony (x pg. 531) fishing is important occupation---trawls are forbidden--size of nets are limited--no license required--nets are stationary, circular, throwing, and drag types and a special net operated from two boats is used during Monsoon--drag nets are used from shore---surplus catch salted for export---pearl diving requires license.

Species

Coast of Eritrea---(x pg. 115) sharks are chief species caught---pearl fisheries---Jebel Zuqar Islands----fishermen---no search of sharks fins, fish and turtle---.

Coast of Eastern Aden Protectorate (x pg. 147) sardines abound in winter months; sting-rays, porpoise, and sharks are also caught---lobsters are rejected as their use is unknown---.

Aden Colony (x pg. 531)---chief edible fish are:

Shark	Sea-perch	Rock cod
Barracuda	dolphin	Soles
Horse-mackerel	Small tunney	Mullet

Crabs, crawfish - all year. Oysters - in winter.

Report on the fishes and fishing of the Persian Gulf, with notes on those at Jidda on the Red Sea.

Donald S. Erdman,
U.S. Nationa Museum.

1. Fishing grounds

A preliminary fishery survey of the waters close to the area of Ras Tanura, Saudi-Arabia, was conducted in the spring and summer of 1948 by the Arabian-American Oil Company with myself as representative of the Smithsonian Institution.

The area surveyed by boat included the shallow coastal waters of Tarut Bay, Ras Tanura, Ras Kaliya (about 20 miles north of Ras Tanura), Chaschuse Island about 10 miles south of Ras Tanura and 2 miles west of Dammam, and Najwa shoal 8 miles southeast of Ras Tanura, or 35 miles of coast line to about 5 miles off shore.

A three week trip was made by me to Jidda where I observed market fishes, and collected shore fishes. Local names were obtained. A week's visit was made to Bahrain Island. The market at Manama was visited, and collections were obtained from Manama harbor.

2. Species of fishes.

Explanation of names used in following tabulation of species: The fishes are not listed in the order of quantity caught since I do not have the necessary information.

The plant at Ras Tanura in general accepts fish of 5 lbs. or over in weight. The weight limitation, of course, eliminates all species that do not attain 5 lbs.

Group A constitutes first class food fishes which should be acceptable at the Ras Tanura fish plant. Group B consist of common food fishes not bought by the fish plant.

GROUP A, FIRST CLASS FISHES

English name	Arabic common names** Persian Gulf	Red Sea	Scientific name	Similar species in U. S. waters if any
1. King mackerel	chanad	dorak	Scomberomorus commersonii	king mackerel
2. Spotted grouper, or sea bass	hamoor (large) balool (small)	kooshar	Epinephelus tauvina	grouper
3. Black grouper	subaitee burtam			
4. Snapper porgy	subaitee		Sparus cuvieri	
5. Crab eater or cobia	sikm		Rachycentron canadus	cobia
6. Hump back porgy	thaur or beguerra		Sparus spinifer	
7. Barracuda	jidd	agam	Sphyraena	barracuda
8. Sea catfish	chim		Arius thalassinus	sea catfish
9. Spotted jackfish	qufdar	gherm	Caranx	jackfish
10. Leatherjack	thulah	dorab	Chorinemus lysan	
11. Pigfish	sharee	shaur	Lethrinus nebulosus	
12. Pompano	bint at tair	abu gurse	Trachinotus	pompano

**The Arabic names used are approximations of the Arabic sounds and do not, purposely, constitute correct English transliterations (which are not easy for a layman to understand). Americans at Ras Tanura are accustomed to Arabic names for many of the fishes. For this reason, many of my English names will be unintelligble, except for such names as tuna, marlin, sardines, etc. Arabic names such as "chanad", "subaitee", "hamoor", etc. are commonly used by Americans in Arabia.

GROUP B, SECOND CLASS FISHES

English name	Arabic common names Persian Gulf	Red Sea	Scientific name	Similar species in U.S. waters if any
Parrotfish	geen	dowahlee	Scarus dussumieri	parrotfish
Spike perch, siganid	sawfee	seejan	Siganus siganus	
Small shark	nauth (small) yaryoor (large)	oz (small)	Carcharhinus menisorrah	ground shark
Guitar ray	soos (large) hirairee (small)	dafam	Rhynchobatus djiddensis	
Large tooth herring	hurff		Chirocentrus dorab	
Billfish	hagool	hilm	Tylosurus sp.	billfish
Flyingfish	jerradah	abu tayar	Parexocoetus	flyingfish
Flat sided billfish	ghurraidy		Ablennes hinas	
Striped grunt	zamroor		Terapon	
Sand perch	hasoon		Sillago sihama	
Spot snapper	naisarah	sam loog	Lutjanus monostigma	lane snapper
Brown line grunt	bzaimeeyah		Scolopsis personatus	
Moharra	musallaqah	guss	Gerres oyena	mojarra (Gerridae)
Grey grunt	shukool	guttreen	Plectorhynchus schotaf	
Red goatfish	hamer arabi	abu diggeen	Mulloidichthys auriflamma	goatfish (Mullidae)
Barred goatfish	hamer bahraini		Upeneus tragula	goatfish (Mullidae)
Red gill porgy	baksheeyah		Lethrinus miniatus	
Broad porgy	shem		Sparus datnia	
Band head porgy	faskar	rubuq	Sparus bifasciatus	
Spot tail porgy	mushawah		Sargus noct	
Brown tooth progy	buttanah		Crenidens crenidens	
Square head porgy	qurqufan		Crenidens	
Purple angel fish	unfooz		Pomacanthus maculosus	
Mullet	mnidee, beeoh	arabi	Chelon	mullet
Sole	hofar		Brachirus orientalis	sole
3 spined fool fish	kulaib al dau		Triacanthus indicus	
Bait fishes				
Silversides	machuse		Atherinidae	silversides
Halfbeak	sils	gumburool	Hemirhamphus	halfbeak
Sardine	oom		Sardinella	sardine
Scad	seenah		Trachurops	scad
Bait (non-fishes)				
Cuttle fish	khatthug			
Blue claw crab	goob goob	abu nguss		blue crab
Shrimp	rubyon	rubyon		shrimp
Mole lobster	mur al rubyon			mole lobster of West Indies

3. Where, When and Tonnage Caught

I have no statistics on tonnage caught, since this was not my part of the work. The fish plant, however, erected for ARAMCO at Ras Tanura has been operating since June 20, 1948 and accurate statistics have been kept.

Tonnage statistics caught and consumed by Arab towns are difficult to obtain. Mr. Gurley has some information on this.

On June 19th, 15 men in about 2 hours caught around sundown by hook and line 1375 lbs. of fish consisting of spotted jack, spotted grouper, parrotfish, 2 cobia, 1 dog face porgy, and one grey grunt was received at the Ras Tanura fish plant. The fish filleted down to 425 lbs.

Mr. Gurley reported there is least waste per pound of the cobia than any other species. The spotted grouper or hamoor because of its vitality and taste, is the most favored fish.

4. Weight and length of species of fishes acceptable at the fish plant. These data are taken from my records.

English name	Weight in pounds min.	max.	usual	Length in inches min.	max.	usual
Spotted grouper	5	50	12	20	40	26
Spotted jack	5	15	7	18	40	25
Cobia	5	38	10	30	45	35
Pigfish	5	8	5-1/2	16	24	18
Black grouper	5	7	5-1/2	14	26	18
Pompano	-	10	-	-	30	-
	Weight and length of species caught trolling					
King mackerel	1	10	5	20	36	28
Barracuda	1	4	2-1/2	20	30	24
Leatherjack	-	13	-	-	35	-
Tuna	-	-	25	not caught by us		

5. Boats and Vessels

The largest native fishing craft is about 40 feet in length, beam 10 feet, draft 3 feet, has a kerosene diesel engine and is called a launch both by natives and Americans. Such a boat is used for bringing fish from the fishing grounds to the fish pier at Ras Tanura. The deck is uncovered and there is no refrigeration. The boat itself is a native built dhow of the same size as the larger type of sailing craft known as the "jalboot". The next largest native fishing craft is propelled by sail and is the "jalboot" about 30 feet in length with a lateen rig sail. Smaller boats 18 feet to 20 feet in length are most common and are propelled by sail and or oars. The size of the crew varies depending on the type of fishing. One or 2 men is the minimum up to 8 or 10 for ordinary fishing and 60 or more men for pearl diving. The smaller boats are more pointed at both bow and stern and are seaworthy though roughly and heavily built. All boats are unpainted save for occasional coatings of raw fish oil and are pieced together like jigsaw puzzles.

6. Fishing Gear

Hand lines are made of untreated cotton line of poor grade. Hooks are of the English type without eyes and are locally purchased at Bahrain Island. Leads are home made and crude.

Trolling gear consists of poor grade untreated cotton line home made lead lures of red and dirt-grey rags and a little shredded rope tied on a single hook, without swivels.

Fish traps ("gerugir") are made oval shaped with flat bottoms, funnels at each end and averaging 2 feet in length by 15 inches in height to 4 feet in length and 3 feet in height. They are woven of straight wire crossed in such a way as to make effective meshes. These traps are effective for catching all kinds of bottom fishes and account for the greatest bulk of fish caught by natives. Bait is used either chopped seaweed, or chopped crabs mixed in clay balls.

Stake traps are made of the center stems of palm leaves tied closely together and stuck in the sand or mud to make stationary traps of considerable size. The fish are removed from the trap-end with a hand scoop net at low tide. The fish enter the trap mostly at night on the high tide.

Floating net traps are made out of thin cotton twine. The lead net runs perpendicularly from the shore into a rectangular shaped trap.

Drag seines are made of cotton thread - 250 feet in length or more, 8 to 12 feet in depth with 2-inch stretched mesh and are operated by about 8 men on sandy shores. They use butt ends of the center stem of palm leaves for floats and pieces of coral rock for weights.

Throw or cast nets - Throw or cast nets made of thin cotton thread are used by fishermen at Qatif on Tarut Bay. Mullet, small porgies, and sardines are caught in this way.

7. Local Market Preferences

Small fish 8" to 10" in total length are abundant in all the markets observed. Since fish are almost always sold in the round as whole fish, the smaller ones seem to be more popular. A list of species observed in the market in order of market preference cannot be rendered accurately. Nearly all fishes caught in this area are used as food. Dried sardines are used for camel fodder. To my knowledge no fish is used for fertilizer.

Bait fishes are sardines, halfbeaks, silversides, small scads, and any kind of fish cut into strips or chunks. Cuttlefish is prized as bait. For wire traps, blue claw crabs and mole lobsters are used. Sand worms are dug from the sand and used for bait on small hooks. The names of the common marine animals used for bait are given in Group B.

8. Other Known Species

English Name	Persian Gulf	Scientific Name	Similar in U.S. waters
bluefin tuna	jibab	Thunnus	Tuna
bonito	"	Scomber microlepidotus	
marlin	silsal	Makaira	marlin
albacore	jibab	Germo alalunga	albacore

In May and June large schools of jibab, bonito and tuna, were frequently seen cutting and jumping at the surface of the sea from a mile to 3 miles off Ras Tanura. These fish would never strike at any lure, and apparently are seldom caught.

A blue fin tuna occurs in the Gulf, but we did not land one. Tuna have been caught by rod and reel off east pier at Ras Tanura.

A type of lampara net might be effective in catching bonito and small tuna.

At buoy #7, Ras Tanura, in May, I saw two or three marlin jumping out of water about a 1/2 mile distant. Sport fishermen report them frequently.

I saw one albacore, Germo alalunga, the tuna like fish with very long pectoral fins, in Tarut Bay.

Marine animals other than fish forms: - An important additional source of food, are crustacea, molluscs, porpoise, and sea turtles. Poisonous sea snakes, less than 4 feet in length, are abundant, but useless as food or bait. They do not molest swimmers.

The crustacea include edible shrimp, abundant in Tarut Bay which are popular among ARAMCO employees, and 300 lb. landings are not unusual at the Ras Tanura fish

pier. The edible blue claw crabs are abundant in Tarut bay, and are prized as bait for wire fish traps. The mole lobster occurs in fair numbers and has delicious white tail meat. The offshore islands are reported to have spiny lobsters.

Molluscs include the abundant cuttlefish prized as food and as bait. Cuttle bones on the beach a foot long are not unusual. A little squid occurs in limited numbers. I saw no octopus in the Gulf, but I saw several in the Red Sea. A small clam, edible in winter occurs in some numbers, but on the whole shell molluscs are small in size and are not used as food around Ras Tanura.

Two species of porpoise are abundant at Ras Tanura, but the Arabs have a superstition against killing them. Porpoise meat, if properly prepared, makes good food.

Large sea turtles occur in considerable numbers, breeding on outlying islands in the Gulf. I saw a turtle with a shell 4 feet long at Ras Tanura near the fish pier. The Arabs eat only the eggs . Turtles should be rigorously protected by law, especially on their bredding grounds.

Jellyfishes (Coelenterata) of several species occur in prodigious numbers in the Gulf especially in the summer season. In June we passed a solid mass of large whitish jellyfish in a 100 foot wide belt between Al Khobar and Bahrain, extending as far as the eye could see.

Jellyfish are effective destroyers of plankton, and are thus indirectly great enemies of fish; they are, however, a biological evidence of a certain rich fertility in the water. Two poisonous jellyfishes occur; one the "dool" is genuinely feared by pearl divers.

The pearl industry, well circumscribed by Arab law, is past its prime. Pearl oysters make good fish bait but are not used as food.

9. Oceanography and Weather

Nearly all the waters in the Ras Tanura area are shallow. Ten fathoms can be considered very deep and there are many areas 2 or 3 miles offshore which have less than 1 fathom at low tide. At low tide some areas are exposed in Tarut Bay and at "Najwa" shoal.

Anton Mohr records 36°C. temperature of sea water at Bahrain Island. On August 5th, 1948, I recorded a temperature of 39°C. in the water near Chaschuse Island. The air temperature was about 40°C. at 2 p.m. The water was actually uncomfortably hot to wade in at first. A shallow pond on Chaschuse Island was filled with large schools of silversides and mullet. Blegvad records a low of 14.9°C. water temperature at Bender Shahpur during a rainy period in February 1938.

The bottom around Ras Tanura is mostly hard bare coral rock in the Gulf itself except for areas of sand. In Tarut Bay, however, many areas are covered

thickly with a fine grey silt which seems to have no bottom, with a few out croppings of rock and corals. Two species of living coral occur, a small brain coral and a small branching coral; both growing within a fathom of the surface and seldom exposed at low tide. There is nothing in this area to justify the use of the term coral reef. Light tan colored sand occurs in spots where tidal currents deposit it.

Tidal currents exceeding 5 knots occur at Ras Tanura and in parts of Tarut Bay. The tide varies in height as much as 7 feet. There are said to be fresh water upswellings in the Gulf. Blegvad, reports the highest salinity, 42.6 per cent at the Bahrain Islands, which may be true of Ras Tanura and Tarut Bay.

Jidda (Red Sea) in contrast to Ras Tanura has an average tidal change of six inches, and has extensive shore coral reefs with a number of species of brightly colored green and red corals. At Jidda more species of fish occur than in the Persian Gulf at Ras Tanura. In quantity of fish, however, the Persian Gulf seems to be richer than the Red Sea.

Fishing is impossible during shamals (strong northerly dust storms) which damage nets and stir up the bottom in shallow water. The mid-summer calm season is used for pearl diving. During the approach of summer, many fish move from shallow shore waters to deeper water. This may account for better catches of fish in stake traps in the winter or spring rather than summer.

10. Purchase and Repair of Gear

Only very primitive fishing gear is available locally. Most of the hooks and twine are purchased from Bahrain Island at Manama. Fishermen are skilled with their hands in making netting, ropes, wire fish traps, palm stake fish traps, and with the up-keep of their own boats. The fishermen would probably be slow to accept new ideas.

In Arabia, most fish are sold to the purchaser through fish contractors, men who buy from the fishermen and sell to the consumers. ARAMCO buys from one or more fish contractors, although they are willing to buy directly from the fishermen.

On the whole, Persian Gulf Arabs have an attitude of friendliness to Americans, and would appreciate the use of improved fishing gear if made available to them. It is probable, however, that changes in traditional fishing practices would for a time, be resented by some.

11. Legal Problems and Customs

Fishermen with palm stake traps have hereditary or purchased rights to the waters where their trap is placed. Until recently 10 per cent tax was levied on catches of fishermen by the government. The Arabian customs are rather difficult to deal with and have high levies on imported articles including some

fishing equipment. Customs officials are always suspicious, from ignorance alone if nothing else.

I believe that most fishermen are licensed to fish, but the laws probably vary. I think that laws are more liberal in Bahrain Island than in Saudi-Arabia. In the development of any fishery or a survey, agreements should be made ahead of time with the Saudi-Arab government to admit such fishing equipment duty free. I paid a $30.00 duty on a $70.00 camera, which belonged to the U. S. Government.

12. Religious Problems and Customs

Saudi-Arabia is Moslem, in theory, law and strict practice. The Moslem is a way of life for all of its followers in a way that Christianity cannot boast of. Frequent periods of prayer are observed during the day, and the practice of the month of "Rhamadhan" is strictly observed. "Rhamadhan" is the Moslem period of fasting. Nothing is to be eaten or drunk from dawn till sunset for 28 days. Though there are prescribed exceptions, the month of Rhamadhan greatly slows down fishing and all business as far as Arabs are concerned.

The Arabs of Bahrain and Ras Tanura and Saihat do not eat "sea catfish", because they think the catfish does not belong to the sea. The fact that catfish do not have scales may also be a factor (See Blegvad p. 73). Most other fish are eaten with the exception of the blowfish (Tetraodontidae) which are said to be poisonous. The small nurse shark (Chiloscyllium griseum) is not good for fish bait or food. The "naud" (a small grey shark), on the other hand is a popular delicacy among the Arabs.

The Moslem religion tends to hold its people back from accepting new ways, and in all probability any progress will be slow.

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Fishery Leaflet 304

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PART I - FISH OF THE PERSIAN AND OMAN GULFS

PART II - EDIBLE FISH IN THE PERSIAN GULF

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FISH OF THE PERSIAN AND OMAN GULFS 1/

As indicated in Embassy's Report No. 82, dated January 24, 1946, the Iranian Government has established a Bureau of Fisheries and Wildlife within the Ministry of Agriculture. This Bureau is under the direction of Mr. Esmail Rostami who supplied most of the information given in this report.

Mr. Rostami related that to date his efforts have been directed toward securing factual information about the fish and wildlife of Iran preparatory to formulating recommendations for laws and regulations; organizing a program of exploitation; and establishing needed laboratory facilities. Therefore, no action has been taken to carry out the duties mentioned in the Ministry's announcement referred to in Embassy's Report No. 82 of January 24, 1946.

Kinds of Fish and Habitat

The fish indigenous to the Iranian side of the Persian Gulf and the Gulf of Oman have been identified by Dr. H. Blegvad, a Danish zoologist. 2/ Mr.

1/Prepared by H. G. Bolster, Agricultural Attache, American Embassy, Tehran, Iran. December 31, 1947. (Report No. Ag. 52).

2/ Director of Biological Station, Copenhagen.

Rostami has classified these into four groups as follows:

Group A

Chorinemus sp.
Cybiums (commersonii)
Chorinemus sp.
Lutjamus argentinaculatus
Otolithus ruber
Polynemus tetradactylus
Pristipoma Guoraca
Stromateus Sinensis
Stromateus niger
Teuthis sp.

Fish of the above group are large edible fish usually weighing upward of two kilograms. This group represents about 60 percent of the catch in the Persian Gulf.

Group B

Chaetoessus
Clupea sp. (petites)
Clupea sp.
Mugil sp. (petit esp)
Mugil sp. (esp. plus grande, des escailles plus grandes)
Silago sihama.

Group "B" are small fish including sardines and represents about 30 percent of the total Persian Gulf production.

Group C

Charcharias
Siluridae (particulierament gen arius)

This group includes fish without scales such as sharks and catfish. The eating of these fish is prohibited by the religious laws of the Shi's sect of Mohammedans. They are, however, used as food by the Sunnis. The group accounts for about eight percent of the total Persian Gulf production.

Group D

Ambassis sp.
Balistos
Bent N B Aroose N: Diagramma punctatum
Chiloscyllium
Caranx sp.
Crenidens indiciums
Chaerops sp. seudoscarus sp.
Chirocentrus dorab
Chrysophrys bifasciata
Cybium (guttatum)
Clupea sp. (petit)

Charcharias
Clupea sp.
Chatoessus sp.
Clupea ilisha
Chrysophrys cuviereri
Chorinemus sp.
Diagramma punctatum
Diagramma griseum
Diagramma cinctum
Drepane punctata
Equula sp. caranx
Engraulis sp.
Echeis sp.
Elacate nigra
Ephippus orbis
Fistularia
Fahrialleh
Gerres sp.
Hemirhampus sp.
Holacanthus sp.
Lutjanus fulviflamma
Lutjanus sp. (esp. grande et rose)
Leptosynanceia melanostigma
Lethrinus sp.
Lethrinus nebulosus
Muraenides
Myliobatis
Narcine (Raie eletricque)
Narcone sp.
Percide grande indetermine
Pristis sp.
Pristis
Psedoscarus sp.
Pseudorhombus
Pristipoma stridens
Peterois sp.
Plotosus arab.
Pteroplatea sp.
Pellona sp.
Pleuronectidae
Periophthalmus
Pellona sp.
Periophthamus
Platycephalus sp.
Polynemus neytarius
Pagrus spinifer
Requin esp. carcharias
Raie esp. trygen
Rhinobatus
Serranus (stoliczhae, petit)
Sciaena sp.
Scomber sp.
Solea sp.
Sphyraena sp.

Synagris
Gargus noct.
Serranus sp.
Saurida tumbil
Shahri (esp. petites)
Scropaenide
Sphryraena sp.
Scopiopsis sp.
Serranus aureolatus
Scatophagus argus
Tetrodon leopardus
Trichiurus sp.
Triacanthus striglifer
Tetrodon stellatus
Triacanthus sp.
Therapon sp.
Tenthis sp.
Upenoides

This large group of fish is reported to be commercially unimportant at the present time, accounting for not more than two percent of the total catch in the Persian Gulf.

The fish of the Persian Gulf and the Gulf of Oman are of marine coastal type. The percentage of small fish is higher in the Gulf of Oman and decreases westward. Except for the Khuzistan coastal region no important flow of fresh water exists. The average depth of the Persian Gulf is reported to be about 50 meters, with a maximum depth of 100 meters at the Straight of Hormuz. The sea tide of the area averages approximately two meters.

Production

The six principal fish production centers of Southern Iran and the estimated annual production of each are as follows:

Khuzistan	1000	metric	tons
Bushire	1000	"	"
Lingeh	2000	"	"
Abbassi	2000	"	"
Jask	1000	"	"
Chah-Bahar	1000	"	"

With the exception of the 50-60 tons of sardines canned annually in the Government cannery at Bandar Abbas, no data are available as to the percentage of the total 8000 ton catch which is dried, salted or sold fresh. It is thought, however, that the bulk of these fish are dried, with the next highest percentage being sold as fresh fish.

The cannery at Bandar Abbas is at present consuming about 100-120 tons of fresh fish annually. The Anglo-Iranian Oil Company buys annually 400-500 tons. Purchases for both these concerns are made through contacts with merchants.

Mr. Rostami is of the opinion that the fish production of the Persian Gulf and the Gulf of Oman could easily be expanded to 200,000 metric tons and that a

ready market could be found for such a production. He points out that India alone might provide a market for even larger quantities.

Fishing Methods and Equipment

Methods of fishing and types of gear used in Southern Iran are extremely primitive. For the most part these are based on the natural movement of the fish and consequently the equipment used is generally of stationary types. In some cases boats of one-half to one ton capacity are used. These are usually propelled by oars or sails.

The most common types of equipment used by southern fishermen are briefly as follows:

Drift Net or "Daam" - This is a stationary net devised to intercept sizeable fish which, in attempting to pass it, are caught by the gills.

Fish-weir or "Moshta" - The moshta is a trap made of palm branches and works on the principle of admitting the fish on flood tide and trapping them on the ebb.

Cage or "Ghafas" - A funnel-shaped stationary trap made of palm branches and set in the sand with its mouth facing the sea. Usually a series of these traps are fitted together. Fish enter this trap also on flood tide.

Seine Net or "Toor" - This is the common fish-net and is usually employed in shallow water.

Hook and Line or "Ghollab" - Baited hook and line are commonly used for hand fishing.

Commercial Fishery Enterprises

The total number of fishermen on the southern coast of Iran is estimated at 8000. Merchants, in the several ports, usually contract with groups of 12 to 16 fishermen, furnishing them the necessary equipment. For the use of such equipment the fishermen deliver to the merchants 50 percent of their catch. The remaining 50 percent is divided equally among the fishermen except that the crew captain or "Nav-Khoda" usually receives twice as much as an ordinary fisherman.

The only important fish processing plant in Southern Iran is the Government-owned canning factory at Bandar Abbas. This plant was constructed in 1940 by a Danish company for the Iranian Government and began operations in 1941. It is a portable plant made of asbestos and is said to have a capacity of five tons of fish per eight-hour shift. Under present management, however, the plant is canning only sardines of which the average annual production is only about 50-60 metric tons. The sardines canned in this plant are packed in olive oil produced in Iran.

The Bandar Abbas plant is also equipped for oil extraction and the production of fish flour. This equipment has been used only once, however, since its installation. About three years ago 11 tons of fish flour were produced

but the cost of production was excessive and the Government still has 7 tons of the product on hand.

The operating efficiency of the cannery is almost as bad. Fresh sardines are purchased at from one to two rials a kilogram (1.75 rials a kilo at present). A kilogram of fresh sardines produces on the average about one-half kilogram of the canned product. The Government is selling canned sardines at 60-70 rials a kilogram but the factory fails to show any profit. The large number of administrative employees and the lack of competent technical supervision is said to be mainly responsible for this situation.

Working Conditions among the Fishermen

As stated above, there are approximately 8000 men engaged in fishing off the coast of Southern Iran. Together with their families, this means that about 30,000 people of that area are dependent upon fishing for a livelihood. These people are engaged in fishing about nine months out of the year. During the remaining three months most of them are employed in the date harvest. They are extremely poor, lacking even the tools needed to practice their profession. It will be apparent that even if the total annual catch were divided equally among these fishermen they would have for sale only about 1000 kilos of fish. At most these would bring 2 - 3000 rials on the market. Under such low income condition it is said that these people live largely on fish and dates throughout the year.

Rate of Exchange

The official buying and selling rate for U. S. dollars is 32 rials and 32.5 rials respectively. The free market rate on December 29 was about 65 rials to the U. S. dollar.

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EDIBLE FISH IN THE PERSIAN GULF 1/

As commercial fishing in the Persian Gulf is negligible and the vast fish resources of the Gulf have long gone untapped, the gathering of information locally on edible fish in the Gulf has been difficult. In addition, since the fishing industry is a minor one, no statistics are kept on fishing operations. The fishing done by the peoples living on the shores of the Gulf is principally the labor of individual fishermen on a small scale for local consumption. Although edible fish are abundant, the main reason that commercial fishing has not been developed as it has in other areas is because of the bad climatic conditions. The torrid heat during most of the year in the Gulf area makes refrigeration necessary in fishing craft and in vehicles which transport the fish to markets. To date, fishing has been conducted in small, slow, and unrefrigerated sailing vessels which are undesirable from a commercial fisherman's point of view.

1/ Prepared by Robert R. Schott, American Vice Consul, American Consulate, Basra, Iraq. March 27, 1948. (Report No. 8).

Inasmuch as the main population centers until recently have been located from 350 - 700 miles inland from the Gulf, fishing on a large scale has been impracticable. With the growth, however, of the oil centers at Dhahran, Bahrein, Kuwait, Abadan, and Basra, with their large American and European communities, the demand for edible fish should justify commercial fishing operations.

Kinds of Fish

The fish whose habitat is in the Persian Gulf are: (production figures unobtainable)

1. Persian Gulf sea fish which do not enter the rivers and swamps:

Dahgouk	(Eleuteronema Tetradactilus)
Zoulieidi	(Pampus Argenteus)
Zoubeidi	(Chondreplites Chinensis)
Halavai	(Pampidae)
Hamour	(Serranidae)
Nagrour	(Pomadsis Argirous)
Nouvebi	(Otolithus Rouber)
Shmai	(Scienidae)
Tao-tao	(Pseudosciene sina)
Zil'a	(Scuoberoidae)
Habbat	(Scuoberoidae)
Tchendal	(Petrus Belayewi)
Bintennahouda	(Scatophagidae)
Mycht Elgavvi	(Percomorphi)
Hassoun	(Sillago Shiams)
Hammam	(Percomorphi)
Wahar	(Plati cefalus Indicus)
Tchoum	(Arius Thalassinus)
Mislak el Bahr	(Heterosomata)
Messannettor	(Cynoglossus Lingva)
Abou Avena	(Ilisha Filigera)
Hoff	(Clupeoidea)

2. Sea fish which enter the Shatt-al-Arab River habitating the river and the southern swamps (Hors) but do not go beyond tide water:

Biaha	(Mugil oligolepis)
Chanak	(Sparidae-Acanthopagrus Berda)
Yaffoud	(Nematolosa Nazous)
Chiha	(Thrissoclea Purava)
Mislak	(Heterosomata Brachirus Orientalis)
Mahiet en Nebi	(Tylosurus Strongilura)

3. Sea fish that enter the Shatt-al-Arab River and the marshes but go beyond tide water up the Tigris, Euphrates, and Karun rivers:

Sbour	(Hilsa Ilisha)
Kosetch	(Karharius Gangeticus)

Methods of Fishing and Types of Gear Used

The sea fish that enter the Shatt-al-Arab and the southern swamps do so to feed on the rich grazings that are found in these waters, and, subsequently, to spawn there. These fish are caught by nets, hook and line, spear, and by fish traps (milans). Fish traps are also used on the Iraqi and Iranian coasts to a great extent. Milans are fence-like erections made of date palm branches stripped of their leaves and interwoven with string. At low tide level these branches are imbedded on the shore. When the tide rises the milans are inundated by water and trap the unwary fish at ebb tide. Then the fishermen simply collect their catch. Large quantities are caught in this manner, but rough weather easily destroys these frail traps and the fishermen then resort to the use of nets.

There are fifty registered Iraqi sailing craft engaged in fishing in the Persian Gulf and approximately 200 Iranian craft. These vessels fish with small floating nets, and are almost all privately owned. The number of fishermen in each craft are from three to four men, often relatives. When the craft and net are owned by one fisherman who employs others not his relatives, he normally furnishes the food and gives his fellow fishermen a share of the profits from the sale of the fish. The small sailing craft used by these fishermen are open, one-masted vessels, without a deck.

Commercial Fishing Enterprises

Sea fish caught at the mouth of the Shatt-al-Arab river are brought to Fao and thence to Basra, Iraq to be sold at auction in the bazar.

The Anglo-Iranian Oil Company at Abadan, Iran, which has a European population of about 2,000 purchases considerable quantities of fish. Two large motor launches have been assigned by the Company to transport fish for the Abadan bazar and Company staff mess. These launches supplied with ice go out in the Gulf each day and buy from the fishermen whatever quantity of fish obtainable. The price at which the fish is sold in the Abadan market to contractors is controlled by the oil company.

At Bandar Abbas, Iran, the Iranian Government operates a sardine canning factory. The plant is only operated four months each year because of the intense heat there during the other eight months. As this out of the way installation is over 600 miles from Basra, little is known here about the yearly production of tinned sardines or about the methods of sardine fishing at Bandar Abbas.

The Basra Port Directorate plans to operate a small refrigerated fishing trawler with a capacity of 100 tons from Fao, Iraq. The trawler is now being built in the United Kingdom and should be ready for fishing at the end of 1948. The fish will be brought to Basra, where 80% of it will be transported to Baghdad by refrigerated railway car and the remainder will be distributed in Basra. The trawler will be captained by a British Master, will be maintained by a British engineer, and manned by an Iraqi crew.

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No. 4

American Consulate
Aden, Arabia, June 7, 1948.

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FISHING INDUSTRY OF THE GULF OF ADEN

Prepared by Robert E. Ferris, American Vice Consul

Background of the Industry

For many centuries along the southern coast of Arabia, whose shores are washed by the waters of the Gulf of Aden and the Indian Ocean, fishing has been a casual industry, one whose production methods are most primitive, but whose potentialities are believed great. There are none of the intense p roduction methods which characterize this industry in the United States or the Scandinavian countries - powered vessels, packing houses, fish reduction plants - but rather, primarily, there is seen being utilized the primitive canoe, some very small dhows, and hand equipment. Actual production figures have never been compiled, but it is known that while most of the fish caught is used for local consumption many shipments of dried and salted fish are sent irregularly into the hinterlands, to Ceylon and India, and to the British Somaliland coast.

Location of Fishing Grounds

There is no specific area where fish are most abundant, as far as the Aden Government authorities are able to determine - this seeming to remain the secret of the individual fisherman. The continental shelf is quite narrow, of not more than five or six miles extent into the Gulf; but along this shelf, from the Island of Perim, in the Straits of Bab-el-Mandeb, to the Mahra Coast, approximately five hundred miles east of Aden, is done most of the fishing for sardines, rock fish, snappers, and groupers. Shark, and export fish primarily, is most often taken on the Mahra Coast, at Socotra, and on the Somaliland Coast.

Unfortunately, Southern Arabia does not have good harbors, nor is there very much fresh water. Thus the technical difficulties would be quite great should major expansion of this industry be desired - which appears to be true at this time. The further east along the Southern Coast one travels the more fish he finds. According to surveys made by the Fisheries Advisor to the British Secretary of State the best fishing

grounds

grounds seem to be off the harbors of Bir Ali, Mukalla, Shuqra, Al Hisi, and the Mahra Coast.

Fishermen and Employment

Because there is no organized fishing industry it is virtually impossible to determine the number of fishermen plying their trade. The wages they receive depends upon the amount of fish they catch and personally market, for most businesses are small, individually owned and operated enterprises, operating upon the mere subsistence level. They may labor from sun-up until sundown, and their reward is predicated upon their individual abilities and luck. There are, however, some small dhows which will carry a crew of eight to ten men, but there has been no tabulations compiled in this area of wages, numbers of workers, or working conditions, for, with the exceptions of the few shipments to India and Ceylon, this is primitive enterprise.

Fishing Vessels

The fringe of the coastal waters are mainly exploited from native one-to-five man canoes, of twelve to twenty-five feet in length. Some of the larger canoes may reach thirty-five feet overall, with a crew of eight or nine men. Next in size, after the larger, planked canoe, is the small dhow, which may have a complement of twelve fishermen, but these are relatively few in number. There are no native-owned powered fishing craft. Recently the British Government has based in Aden a small power craft capable of carrying ice in its forward hatch, for experimental and research projects under the direction of the recently appointed Aden Government Fisheries Officer. But at the present time there are insufficient harbor facilities, such as docking, loading, and icing services, to have warranted power and refrigerated craft along the southern Arabian coast.

Species of Fish

Little is known about the many different classes of fish caught just off-shore, and the local names of one class of fish may be different in the several areas. There appear to be at least two species of sardine; the kingfish (believed to be the scomberomouris); and, besides several species of shark, species of mackerel, snappers, rock fish, and three species of tuna - one identified as the bluefin. The dominant specie of sardine seems to be the dussumeria; the small mackerel is probably scomber microlepidotus; and the snapper has been identified as epiniphelus tauvina.

During the winter season is found the best fishing, and it is then that the sardines become very numerous along the coast east of Aden. At the height of the season sardines are so plentiful in the eastern coastal villages that they can be purchased at thirty for a penny. Tuna, much larger, may be

purchased

purchased at the same time at an extremely low price. At Al Hisi about ninety fishermen within a seven-months period produced about a million pounds, or within an eight-month season about an average of five and one-half tons per man. At Shihr - which exports dried sardines, sardine oil, and wet salted kingfish - were caught during this season by some 3,600 men a weight equivalent to about 8,000 tons of wet sardines, and 300 tons of wet kingfish, or about 2.3 tons per man for export. It is presumed that a like quantity could have been sent up-country and consumed locally. According to figurs obtained from local sources in December, 1946, £20,000 worth of sardines were dried in Aden. Two hundred sixty miles east of Aden are found abundant sardines, suitable for the production of sardine oil and the dried article. The sardines are spread out on the sand, allowed to dry thoroughly in but a few days, and then are exported, mainly as fodder for cattle, and as fertilizer. The sardine season begins at the end of the southwest monsoon in September, and between October and the end of November they are at their fattest. Throughout the rest of the year, from January on, they become gradually scarcer. The larger fish, tuna, kingfish, etc., are gutted, split, scored, and well rubbed with salt. These fish are as tasty as any on the world market. Aden warehouses regularly held in stock well over one thousand tons of this dried sardine product.

Tunny, or tuna, between the months of September to January are at their best, the greatest quantity being caught in October to December. In October to December they are caught in depths of sixty to seventy fathoms, while in January to June they are taken in or over much greater depths. The kingfish, caught in shallower waters than the tunny, is very highly prized. They may be caught by hook or by a keddle-net. There is no special season for shark.

Fishing Gear Used

Of all the methods used to catch fish in the Gulf of Aden the commonest is the hook and line. Used from boats mainly, cast nets are the nets most frequently employed. Waders may work from the beach or from the rocks, casting nets varying in shapes and sizes. The sardine boats cast a larger net of seventy-two feet in circumference, with a mesh of one-half inch bar. The smallest gill net has a mesh of about 120 rows to the yard; medium-sized nets have about eighty-four rows to the yard; and a large sardine net has about fifty-six rows to the yard.

At Aden Colony and Shuqra beach seines of about ninety yards in length, of mesh of one-inch bar, about fifteen feet deep are used. The actual net has a long wing down both sides, about thirty yards long, and made of twisted palm leaf strips. No floats are needed.

The sardine

The sardine seine is a huge thing. The actual net, forty feet wide by one hundred sixty feet long, rectangular in shape, is made of cotton and woven into a fine mesh ninety rows to the yard. The head and foot of the forty-foot openings are fastened to headlines and footropes by very long staplings of twisted palm leaf strip thirty inches long. A single heavy stone weights the middle of the footrope. There are no floats on the headline, but instead a strong rope becket is held by a canoe, which acts as the float. The netting itself is the bunt or pocket of the seine. Twisted palm-leaf strips form the wings in the shape of an open mesh-work with meshes of twelve-inch bar and fourteen rows deep - or seven full meshes deep. To each wing of about 400 yards is attached hauling ropes.

The use of this gear necessitates fair weather, for it is of great weight and bulk and must be jointly operated from boat and shore. Thirty to fifty men work the seine, and at times the catch can be immense.

Other gear in popular use are: wickerwork traps, with non-return valve - used for small fish; the shark spear, twelve feet long, detachable barbed point; common cotton cord and simple hooks - most of which, incidentally, are imported from Norway.

Often, late at nite and in the early morning hours, one may see camel trains slowly plodding into Aden Colony, laden with the fish caught near the eastern coastal villages and to be sold in Aden markets that day. The catches are either delivered to a few merchants to be dried, or are sold openly in native market stalls.

Aden Shell Fishing Company

A new division of the fishing industry, that of processing shells into rough button forms, has been developed in Aden, but it is no market for local fishermen, for the shells are mainly imported from Australia and some from the Red Sea area. At the present writing the Aden Shell Fishing Company occupies a large, rented building, containing within it storage rooms for the rough-finished article, large cement tanks in which the shells are soaked, processing rooms, and a machine shop (operated by five Italian machinists) where the processing machines are both made and repaired. Only the rough button form has been produced thus far, and after cutting the forms are graded and sold to the "Dominion Manufacturing Company", Larnaca, Cyprus, where they are finished.

The spiral, cone-shaped trocas is the shell used at present, from which forty to fifty button forms are cut; but

experiments

experiments are being made with others, mainly the green snail, from the East Indies. When the shells first are brought in they are graded according to size, sorted, and soaked in water for seven days in order to extract all the heat from them prior to cutting. There are at present seventy-five cutting machines, some made in the company's own shops, some imported from Asmara, Eritrea - where buttons from Red Sea shells are being cut and finished. Under full operation some 500 - 600 people are employed - cutters, sorters, feeders, coolies, etc. - but operation is irregular.

After cutting, the button forms are shipped out in bags of about 150 gross each, four bags to a case.

Mr. Raymond R. Feinstein, of London, is the head of the organization, and the local managers are Mr. Robert Ceribelli, General Manager, and Mr. Polimeni Giovanni, Works Manager.

Outlook of the Industry

This sudden interest in Gulf of Aden fishing awakened in the British Government may be looked upon as one of the measures Britain, in her post-war financial straits, is searching for in order to build up her export trade, develop more of an Empire self-sufficiency, develop her colonies financially, and aid them in the strengthening of their insufficient protein diet (viz., India and East Africa). Last year the Fisheries Adviser to the British Secretary of State made what was termed by the local authorities as a "flying trip through the Colonies", and when asked where, to his knowledge, might England find the best fishing grounds, he emphatically replied, "The Gulf of Aden". Since then thre has been appointed to Aden a Fisheries Officer, a political officer - who necessarily has command of the Arabic language - and two small power boats for research and charting work. Throughout there seems to be an air of great enthusiasm.

Local merchants have put inquiries to this Consulate concerning fish reduction and processing equipment made in the United States, have requested information from American government agencies, for they believe there to be a potent industry lying dormant here. The British Government has done cannery research in the towns of Mukalla and Ash Shihr, and have discovered that the fish oil and vitamin yeild is of a calibre high enough to profitably merit production. The fishing industry along the southern Arabian coast is still under survey, for it is late in the season, and the southwest monsoons are here. However, Great Britain is planning to continue this survey in September, and soon thereafter there should be evidence of what is to be done about the fishing industry in the Gulf of Aden.

SAUDI ARABIA

YEMEN

RED SEA

GULF OF ADEN

DHUFAR

MAHRA

QAIHAD

Mukalla

Qishn

Socotra

Island of

Isthmus of Shihr

SOUTHWEST COAST OF ARABIA

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Aden
June 7, 1960
Report No. 6

Sources of Information:

Interviews:

Mr. [illegible], Aden Government Treasuries Officer

[illegible] Federation, Aden Government Political Officer

Mr. [illegible] Aden Cooperative, local businessman

E. Krumlin and Company, local merchants

Aden Trawl Fishing Company, Ltd., local industry

Enclosure:

Charles L. Sidney, Jr.
American Consul

Robert E. Ferris
American Vice Consul

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Mr. Leonard Schultz
Curator of Fishes
Smithsonian Inst.

No. 4

American Consulate
Aden, Arabia, June 7, 1948.

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Prepared by Robert E. Ferris, American Vice Consul

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Location of Fishing Grounds

There is no specific area where fish are most abundant, as far as the Aden Government authorities are able to determine - this seeming to remain the secret of the individual fisherman. The continental shelf is quite narrow, of not more than five or six miles extent into the Gulf; but along this shelf, from the Island of Perim, in the Straits of Bab-el-Mandeb, to the Mahra Coast, approximately five hundred miles east of Aden, is done most of the fishing for sardines, rock fish, snappers, and groupers. Shark, and export fish primarily, is most often taken on the Mahra Coast, at Socotra, and on the Somaliland Coast.

Unfortunately, Southern Arabia does not have good harbors, nor is there very much fresh water. Thus the technical difficulties would be quite great should major expansion of this industry be desired - which appears to be true at this time. The further east along the Southern Coast one travels the more fish he finds. According to surveys made by the Fisheries Advisor to the British Secretary of State the best fishing

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Because there is no organized fishing industry it is virtually impossible to determine the number of fishermen plying their trade. The wages they receive depends upon the amount of fish they catch and personally market, for most businesses are small, individually owned and operated enterprises, operating upon the mere subsistence level. They may labor from sun-up until sundown, and their reward is predicated upon their individual abilities and luck. There are, however, some small dhows which will carry a crew of eight to ten men, but there has been no tabulations compiled in this area of wages, numbers of workers, or working conditions, for, with the exceptions of the few shipments to India and Ceylon, this is primitive enterprise.

Fishing Vessels

The fringe of the coastal waters are mainly exploited from native one-to-five man canoes, of twelve to twenty-five feet in length. Some of the larger canoes may reach thirty-five feet overall, with a crew of eight or nine men. Next in size, after the larger, planked canoe, is the small dhow, which may have a complement of twelve fishermen, but these are relatively few in number. There are no native-owned powered fishing craft. Recently the British Government has based in Aden a small power craft capable of carrying ice in its forward hatch, for experimental and research projects under the direction of the recently appointed Aden Government Fisheries Officer. But at the present time there are insufficient harbor facilities, such as docking, loading, and icing services, to have warranted power and refrigerated craft along the southern Arabian coast.

Species of Fish

Little is known about the many different classes of fish caught just off-shore, and the local names of one class of fish may be different in the several areas. There appear to be at least two species of sardine; the kingfish (believed to be the scomberomouris); and, besides several species of shark, species of mackerel, snappers, rock fish, and three species of tuna - one identified as the bluefin. The dominant specie of sardine seems to be the dussumeria; the small mackerel is probably scomber microlepidotus; and the snapper has been identified as epiniphelus tauvina.

During the winter season is found the best fishing, and it is then that the sardines become very numerous along the coast east of Aden. At the height of the season sardines are so plentiful in the eastern coastal villages that they can be purchased at thirty for a penny. Tuna, much larger, may be

purchased

purchased at the same time at an extremely low price. At Al Hisi about ninety fishermen within a seven-months period produced about a million pounds, or within an eight-month season about an average of five and one-half tons per man. At Shihr - which exports dried sardines, sardine oil, and wet salted kingfish - were caught during this season by some 3,600 men a weight equivalent to about 8,000 tons of wet sardines, and 300 tons of wet kingfish, or about 2.3 tons per man for export. It is presumed that a like quantity could have been sent up-country and consumed locally. According to figurs obtained from local sources in December, 1946, £20,000 worth of sardines were dried in Aden. Two hundred sixty miles east of Aden are found abundant sardines, suitable for the production of sardine oil and the dried article. The sardines are spread out on the sand, allowed to dry thoroughly in but a few days, and then are exported, mainly as fodder for cattle, and as fertilizer. The sardine season begins at the end of the southwest monsoon in September, and between October and the end of November they are at their fattest. Throughout the rest of the year, from January on, they become gradually scarcer. The larger fish, tuna, kingfish, etc., are gutted, split, scored, and well rubbed with salt. These fish are as tasty as any on the world market. Aden warehouses regularly held in stock well over one thousand tons of this dried sardine product.

Tunny, or tuna, between the months of September to January are at their best, the greatest quantity being caught in October to December. In October to December they are caught in depths of sixty to seventy fathoms, while in January to June they are taken in or over much greater depths. The kingfish, caught in shallower waters than the tunny, is very highly prized. They may be caught by hook or by a keddle-net. There is no special season for shark.

Fishing Gear Used

Of all the methods used to catch fish in the Gulf of Aden the commonest is the hook and line. Used from boats mainly, cast nets are the nets most frequently employed. Waders may work from the beach or from the rocks, casting nets varying in shapes and sizes. The sardine boats cast a larger net of seventy-two feet in circumference, with a mesh of one-half inch bar. The smallest gill net has a mesh of about 120 rows to the yard; medium-sized nets have about eighty-four rows to the yard; and a large sardine net has about fifty-six rows to the yard.

At Aden Colony and Shuqra beach seines of about ninety yards in length, of mesh of one-inch bar, about fifteen feet deep are used. The actual net has a long wing down both sides, about thirty yards long, and made of twisted palm leaf strips. No floats are needed.

The sardine

The sardine seine is a huge thing. The actual net, forty feet wide by one hundred sixty feet long, rectangular in shape, is made of cotton and woven into a fine mesh ninety rows to the yard. The head and foot of the forty-foot openings are fastened to headlines and footropes by very long staplings of twisted palm leaf strip thirty inches long. A single heavy stone weights the middle of the footrope. There are no floats on the headline, but instead a strong rope pocket is held by a canoe, which acts as the float. The netting itself is the bunt or pocket of the seine. Twisted palm-leaf strips form the wings in the shape of an open mesh-work with meshes of twelve-inch bar and fourteen rows deep - or seven full meshes deep. To each wing of about 400 yards is attached hauling ropes.

The use of this gear necessitates fair weather, for it is of great weight and bulk and must be jointly operated from boat and shore. Thirty to fifty men work the seine, and at times the catch can be immense.

Other gear in popular use are: wickerwork traps, with non-return valve - used for small fish; the shark spear, twelve feet long, detachable barbed point; common cotton cord and simple hooks - most of which, incidentally, are imported from Norway.

Often, late at nite and in the early morning hours, one may see camel trains slowly plodding into Aden Colony, laden with the fish caught near the eastern coastal villages and to be sold in Aden markets that day. The catches are either delivered to a few merchants to be dried, or are sold openly in native market stalls.

Aden Shell Fishing Company

A new division of the fishing industry, that of processing shells into rough button forms, has been developed in Aden, but it is no market for local fishermen, for the shells are mainly imported from Australia and some from the Red Sea area. At the present writing the Aden Shell Fishing Company occupies a large, rented building, containing within it storage rooms for the rough-finished article, large cement tanks in which the shells are soaked, processing rooms, and a machine shop (operated by five Italian machinists) where the processing machines are both made and repaired. Only the rough button form has been produced thus far, and after cutting the forms are graded and sold to the "Dominion Manufacturing Company", Larnaca, Cyprus, where they are finished.

The spiral, cone-shaped trocas is the shell used at present, from which forty to fifty button forms are cut; but

experiments

experiments are being made with others, mainly the green snail, from the East Indies. When the shells first are brought in they are graded according to size, sorted, and soaked in water for seven days in order to extract all the heat from them prior to cutting. There are at present seventy-five cutting machines, some made in the company's own shops, some imported from Asmara, Eritrea - where buttons from Red Sea shells are being cut and finished. Under full operation some 500 - 600 people are employed - cutters, sorters, feeders, coolies, etc. - but operation is irregular.

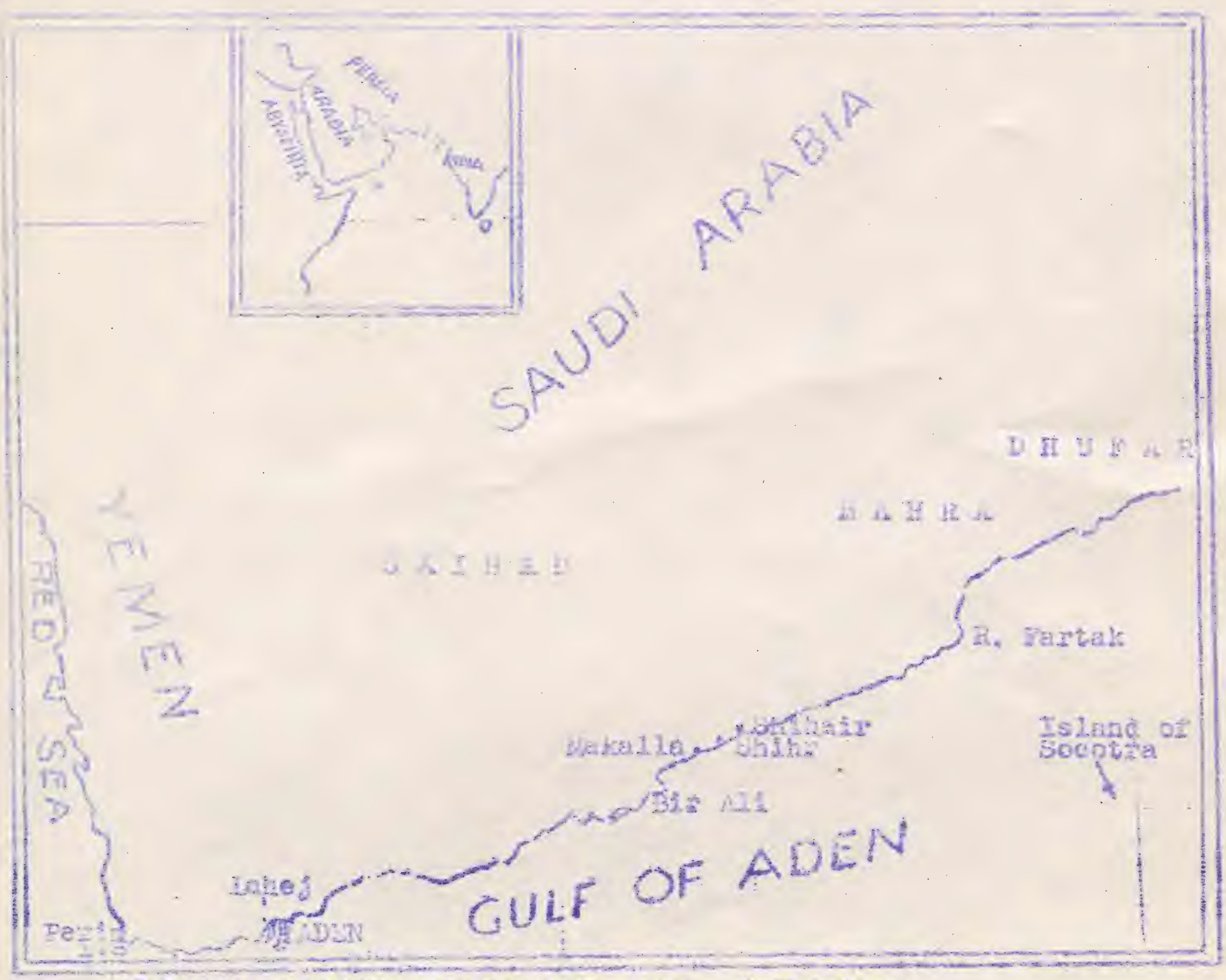
After cutting, the button forms are shipped out in bags of about 150 gross each, four bags to a case.

Mr. Raymond R. Feinstein, of London, is the head of the organization, and the local managers are Mr. Robert Ceribelli, General Manager, and Mr. Polimeni Giovanni, Works Manager.

Outlook of the Industry

This sudden interest in Gulf of Aden fishing awakened in the British Government may be looked upon as one of the measures Britain, in her post-war financial straits, is searching for in order to build up her export trade, develop more of an Empire self-sufficiency, develop her colonies financially, and aid them in the strengthening of their insufficient protein diet (viz., India and East Africa). Last year the Fisheries Adviser to the British Secretary of State made what was termed by the local authorities as a "flying trip through the Colonies", and when asked where, to his knowledge, might England find the best fishing grounds, he emphatically replied, "The Gulf of Aden". Since then thre has been appointed to Aden a Fisheries Officer, a political officer - who necessarily has command of the Arabic language - and two small power boats for research and charting work. Throughout there seems to be an air of great enthusiasm.

Local merchants have put inquiries to this Consulate concerning fish reduction and processing equipment made in the United States, have requested information from American government agencies, for they believe there to be a potent industry lying dormant here. The British Government has done cannery research in the towns of Mukalla and Ash Shihr, and have discovered that the fish oil and vitamin yeild is of a calibre high enough to profitably merit production. The fishing industry along the southern Arabian coast is still under survey, for it is late in the season, and the southwest monsoons are here. However, Great Britain is planning to continue this survey in September, and soon thereafter there should be evidence of what is to be done about the fishing industry in the Gulf of Aden.


PENIN
ARABIA
ABYSSINIA
Kuria
SAUDI ARABIA
D H U F A R
H A D R A M A U T
R. Wartak
Island of Socotra
Mukalla
Bir Ali
GULF OF ADEN
Perim
ADEN
SOUTHWEST COAST OF ARABIA

UNCLASSIFIED

Aden
June 7, 1943
Report No. 4

Sources of Information:

Interviews:

Mr. Ing-Wheeler, Aden Government Fisheries Officer
Mr. Lawrence Hobson, Aden Government Political Officer
Mr. Constantine Athanassacopoulo, local businessman
H. Mohamed and Company, local merchants
Aden Hall Fishing Company, Ltd., local industry

Attached:

Charles S. Sidney, Jr.
American Consul

Robert E. Ferris
American Vice Consul

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MARINE FISHERIES - MIDDLE EAST

(From Middle East Science - A Report to the Director General
Middle East Supply Centre
August 1945
London: His Majesty's Stationery Office 1946)

FISHERY PRODUCTION

Country		Present Production (metric tons)	Probably production if fisheries were developed (metric tons)
Cypres (sea)		400	1,000
	(inland waters)	nil	1,000
Palestine and Transjordan	(Mediterranean & Red Sea)	2,300	4,000
	(inland waters)	700	1,500
Syria and Lebanon	(Mediterranean)	400	1,000
	(inland waters)	500	1,000
Arabian States	(Persian and Oman Gulfs)	?	5,000
	(Red Sea)	?	5,000
Aden Protectorates	(Gulf of Aden)	25,000 (?)	50,000
Iraq	(Persian and Oman Gulfs)	?	10,000
	(inland waters)	5,000 (?)	10,000
Persia	(Persian and Oman Gulfs)	?	20,000
	(Caspian Sea)	5,000	10,000
Egypt	(Mediterranean and Red Sea)	10,000	15,000
	(inland waters)	26,000	28,000
Sudan	(Red Sea)	?	2,000
	(inland waters)	4,000 (?)	10,000
Eritrea	(Red Sea)	1,000	5,000
Ethiopia	(Red Sea)	negligible	1,000
	(inland waters)	"	5,000
Somaliland	(Gulf of Aden)	"	5,000
Cyrenaica and Tripolitania	(Mediterranean)	2,000	5,000
Total	(seas)	46,100 + (?)	139,000
	(inland waters)	36,200 + (?)	56,500
		82,300	195,500

Stages of Development.

Future development of resources may be envisaged in two stages. Firstly, there are possibilities for the immediate increase of existing fisheries where this can be done without endangering the available stocks. This does not call for extensive investigation so much as for overcoming the economic factors which have limited developments to date; facilities

are required for transporting the catch to where it is needed and for preserving it by various means, ranging from icing to dehydration. Secondly, looking to the more distant future, there is need for establishing fishery research in order to build up a body of knowledge which is necessary before a policy can be laid down for continuous development up to but not beyond the limits of the natural resources. Included in such work must be studies of the fishermen, their methods, social and economic organization; and of the fish themselves, their taxonomy, size, growth, breeding-habits, available stocks, and how much crop can be taken each year. Moreover, there must be studies of the fishes' food supply, including smaller fish and other members of the animal kingdom, such as crustaceans and shellfish. These in turn depend on still smaller forms of life which entail further studies, particularly of the multitude of floating animals and plants collectively known as the plankton. Likewise the chemistry and hydrology of seas and fresh waters need attention since on them depends the productivity of all forms of life.

RED SEA

Whereas the Mediterranean fishery is based on ancient tradition and in some respects has worked up to a maximum even with local over-fishing, other areas of sea associated with the Middle East contain large undeveloped resources, and for the most part fishing in them is restricted to shore work using primitive methods.

Gulf of Suez. The Red Sea coast includes parts of eight different countries. Starting from the north, the Gulf of Suez is bounded entirely by Egypt and, though narrow and relatively small, has a potential fishery within easy reach of the Egyptian market. The returns of fish caught by long-lines and shore nets are consistently higher than in the Mediterranean. Some years ago the Misr Company started a commercial experiment with trawlers in the Gulf, but it seems that the mistake was made, as so often in fishery development, of starting in too large a way with trawlers too big for the job. Catches were higher than in the Mediterranean, but the quality of fish was lower and the enterprise was given up as not paying. During the war the Army authorities have caused some development in the Suez Gulf and set up a temporary plant for smoking fish for Army consumotion.

The Gulf of Aqaba has recently received special attention as the site for a fishery because it gives access to the Red Sea for Palestine and Transjordan, both of which abut on to the Gulf's northern tip. For Transjordan, indeed, it is the only possibility of a fishery of any kind, and Arab enterprise has attempted developments there for the past fifteen years or so, but without conspicuous success. Palestine, having a protein shortage during the war and insufficient fish available from other sources, launched a scheme at Aqaba in 1943, with the object of deliverying lorry-loads of fish to its main centres of population at least once a week. The method has been to encourage the local Arab fishermen, in the Gulf itself and around the point of Sinai as far as Tor in the Gulf of Suez, to catch more and to sell their catch. The fish so acquired, mostly at the mouth of the Gulf of Aqaba, are taken by a ship of 150 tons, which is specially fitted with refrigerating apparatus, to the village of Aqaba. Here a large plant for quick-freezing and ice-making has been established to receive the fish and to store it at times when road transport is impossible. From Aqaba the fish is taken in refrigerated lorries by the Sinai route to cold stores at Lydda, from where it is redistributed to retailers in the towns.

Many difficulties have been met and overcome in attempting to establish this fishery. Some of them have been political, but most have been occasioned by the chain of many links which is necessary to connect the primitive fisherman in the Red Sea with the consumer in Jerusalem or Tel Aviv. The various installations have proved to be very expensive. The venture is essentially a Government one, but is handled on the Government's behalf by a British firm of operating agents. There is doubt whether it can work economically when war-time stress is past and normal imports to Palestine become possible. The Gulf of Aqaba is practically virgin water from the fishery point of view, and large catches may be expected during the first few years. Its area is so small and its waters so deep, however, that it is unlikely to support a big permanent fishery, so future development may lie beyond the mouth of the Gulf, in the Red Sea itself. Unfortunately this will still further lengthen the lines of communication to the high-priced markets of Palestine.

The Sudan. Farther south in the Red Sea there has been little development along either the Arabian coast or that of Egypt and the Sudan, chiefly because of the lack of local population and the great distance from markets. Around Port Sudan, however, there is an appreciable fishery for sea slugs which in peace time are transported to China, Trochus shells for mother-of-pearl, and shark which is dried and transported elsewhere by dhow. In this area, which is well served by both railway and shipping, there seems to be an opportunity for future development, particularly to provide inland towns of the Sudan with sea fish. For a number of years Dr. Cyril Crossland devoted much effort to building up the shell industry along this coast. Economic conditions prevented him from seeing the fruits of his labours, but today Trochus and other shell is realizing a high price as a result of the war, and the opportunity for enlarging the industry exists, though perhaps only temporarily.

Eritrea and Yemen. Prospects of a big fishery are much better in the southern part of the Red Sea, including the coasts of Eritrea and Yemen. Under the Italian regime Eritrea had established a fishery based on Massawa, producing roughtly 1,000 tons a year which supplied the Eritrean market. Some of this was undertaken by small Italian trawlers, but a good part was a development from the primitive native fishery using open boats. The possibilities of development in this area have recently been surveyed by Bertram (unpublished), who concluded that it could produce not only enough fish to supply local needs, but a considerable surplus in addition for export. He found several factors limiting such development; a serious shortage of fishing-gear has occurred during the war; there is no assured market; it is difficult to persuade the indigenous people to work beyond the needs of their immediate supply; and there has been some lack of appreciation in responsible quarters of the fishery possibilities. Of these factors the lack of an assured market is the most important. Bertram proposed that a dehydration plant should be established at Massawa and that the surplus product from the southern part of the Red Sea and the Gulf of Aden should be taken there by the sea route for processing. He suggested that the ordinary native method of sun-drying would give a sufficient cure for transport to Massawa without undue loss, and that centres for the accumulation of dried fish should be established at Kamaran island close to the Yemen coast, and at Perim island, both of which are under British administration. He estimated roughly that some 5,000 tons of fish could be made available annually from Eritrea and a similar quantity from Kamaran island. The fish themselves consist mainly of shark which are caught by net and set-hooks, members of the tunny tribe from mackerel size up to 100 lb. or more which are caught by trolling and nets, sardines caught by set-nets and cast-nets, and a variety of other species caught by hand-lining. Of these the shark is best suited for sun-drying because it is the least liable to infestation by insects, and the sardines are the most difficult to handle on account of their oily flesh.

GULF OF ADEN

The Aden Protectorate, extending eastward along the southern shore of the Arabian peninsula, is one of the few parts of the world where in normal times fish is in superabundance. The coastal Arabs are essentially a maritime people, fishing and handling the intricate dhow traffic of the Indian Ocean, and for much of the year they appear to eat little but fish. Even their transport camels, plying between the coast and the unique civilization of the Wadi Hadhramaut 100 miles inland, are foddered to a large extent on dried sardines. Farther east, beyond Saihut, where the true "Ichthyophagi" live, even cattle are foddered on fish. In fact the potential if not the actual production from the sea of the Aden Protectorate is greater than that from the land. Mr. B. Hartley, the Agricultural Officer of Aden, has paid attentionto the fishery and has emphasized that in war time an extreme shortage of fishing-gear had reduced the supply to a dangerous level, and this was undoubtedly a contributory factor to the serious famine recently prevalent in the Hadhramaut. Bertram included this area in his study and has emphasized that the fishery could in the future produce a large surplus of animal protein, even beyond its normal export to India and East Africa. A fisheries officer, Mr. P. H. T. Hartley, spent six months studying the Aden fishery in 1944-5. In his interim report on the fisheries of the Qu'aiti State, one of the most important areas, he emphasizes the dependence not only of the coastal parts but also the inland people of the Wadi Hadhramaut on the marine resources, and attaches more weight to maintaining the status quo than to large-scale development of the resources, with its possible disruptive influences.

The fishery of the south coast of Arabia is seasonal, dependent on north-east winds in winter and the south-west monsoon in summer. During the winter the chief fishery is for sardines, which come inshore at this time and are caught in vast numbers by cast-nets. In addition to their use as human food and animal fodder, either fresh or sun-dried, oil is extracted from the sardines for the local purpose of preserving boats and for export for use chiefly in tanning. The method of extraction is crude in the extreme. The fish are piled into heaps on the beach, and the oil trickling from the rotting mass is collected in runnels in the sand. At Mukalla successful experiments have been made with an improved but simple method, which involves cooking the sardines in vats, expressing the oil with a hand-press, and drying the residue for fodder or manure. During the winter season many of the tunny tribe come near the shore, presumably following the sardines, and are taken by trolling from small craft and by set-nets. During the summer the main fishery is for shark, taken by hook and harpoon and nets of large mesh. The fishery appears to get progressively more productive along the coast eastward. The island of Sokotra, being administered from Aden, is similar to the coast of the Aden Protectorate in that very large fish resources exist and provide most of the subsistence for the small population.

Somaliland. On the south coast of the Gulf of Aden the people of British Somaliland are essentially pastoralists and not fishermen. Consequently, although the potentialities of this coast are probably as great as those of the Aden Protectorate, the fishing operations up to now have been negligible. Here again there is a big opportunity for the future, though a development would probably need the introduction of experienced fishermen from elsewhere. Italian enterprise in the neighbourhood of Cape Guardafui and the coast of Italian Somaliland on the Gulf of Aden caused a

considerable fishery for tunny. Several canning-factories for these fish had been installed with modern machinery and boats, notably at Alula, Bender Kassim, and Kandala. Labour was imported in the form of Italian fisher-girls, who were repatriated on the British occupation. Much of the machinery has been dismantled and some of the boats dispersed, so it is doubtful when these tunny fisheries could be re-established.

PERSIAN GULF

The Resources. On general principles the Persian Gulf, consisting of a large area of water less than 50 fathoms deep, into which flow the Tigris and the Euphrates, should provide some of the most productive fishing-grounds anywhere in the Middle East. From the little yet known about it this indeed appears to be the case. In 1936 to 1938 the Persian Government had a preliminary survey of the fish resources made by Dr. Blegvad, director of the biological station of Denmark, who wrote a confidential report. As a result of his proposals a canning-factory was established at Bandar Abbas on the northern shore of the strait which separates the Persian Gulf from the Gulf of Oman. The fishery supplying this factory is limited to a very small part of the potential area, but there is no lack of fish, and the fact that the factory has not yet worked to full capacity is due to the shortage of canning materials and the policy of maintaining the price of the tinned fish at a very high level. About 50 tons of canned sardines per annum has been the main product, and prawns, which are caught in quantity in big traps, have been canned with success on a trial basis. The factory is run by a company in which the Government has a controlling interest; most of the product is exported to other countries where high war-time prices could be realized. The inland towns of Persia, where protein food is very limited, should be capable of absorbing an enormous quantity of fish, but difficulties of transport and the low spending-power of the people has prevented any appreciable amount reaching them. Thus development of fish resources by the Government has not yet been of any benefit to the Persian people except in producing a small amount of revenue.

Shore Fishery. Around the shore of the Gulf, especially at its northern end, there is a considerable in-shore fishery undertaken mainly by Arabs using large traps and stake-nets. The produce is consumed locally except that in recent years the Anglo-Iranian Oil Company, recognizing the need for protein food among their staff of 4,000 and labour corps of 100,000 or so, have organized a scheme for collecting fish and taking it up the Shatt-al-Arab to Abadan in launches. This scheme has worked well, and the fish collected amounts to about 800 tons per annum.

Trawling and Open-water Seining. Preliminary trials by Dr. Blegvad suggested that open-water fishing the Persian Gulf would produce catches which would compare favourably with those of fisheries in European waters. No development has yet taken place, but the Persian Government and the Anglo-Iranian Oil Company are much interested in the possibilities. The latter has arrangements in hand for obtaining a modern trawler and an experienced skipper. In addition , the Iraq Government hopes to develop a trawler industry from its coastline on the Persian Gulf, and in this the Agricultural Bank of Iraq is interested. If all these developments

take place and inland communications are improved so that the fish can reach the big markets, the time may come when proper regulation of this fishery will be needed, and a further survey, or perhaps a permanent fishery investigation, will be required.

Pearl Fishery. The well-known pearl fisheries of the Persian Gulf are concentrated mainly on the Arab Sheikhdoms of Kuwait and Bahrein. Kuwait is an important centre of the long-distance dhow traffic of the Indian Ocean, and during the summer season of the south-west monsoons, when this trade is largely at a standstill, a hundred dhows or so spend their time pearl fishing. The maritime Arabs of Bahrein are primarily pearl fishers and only secondarily traders. The pearl banks, having a depth of less than 20 fathoms, occupy about a third of the whole area of the Gulf.

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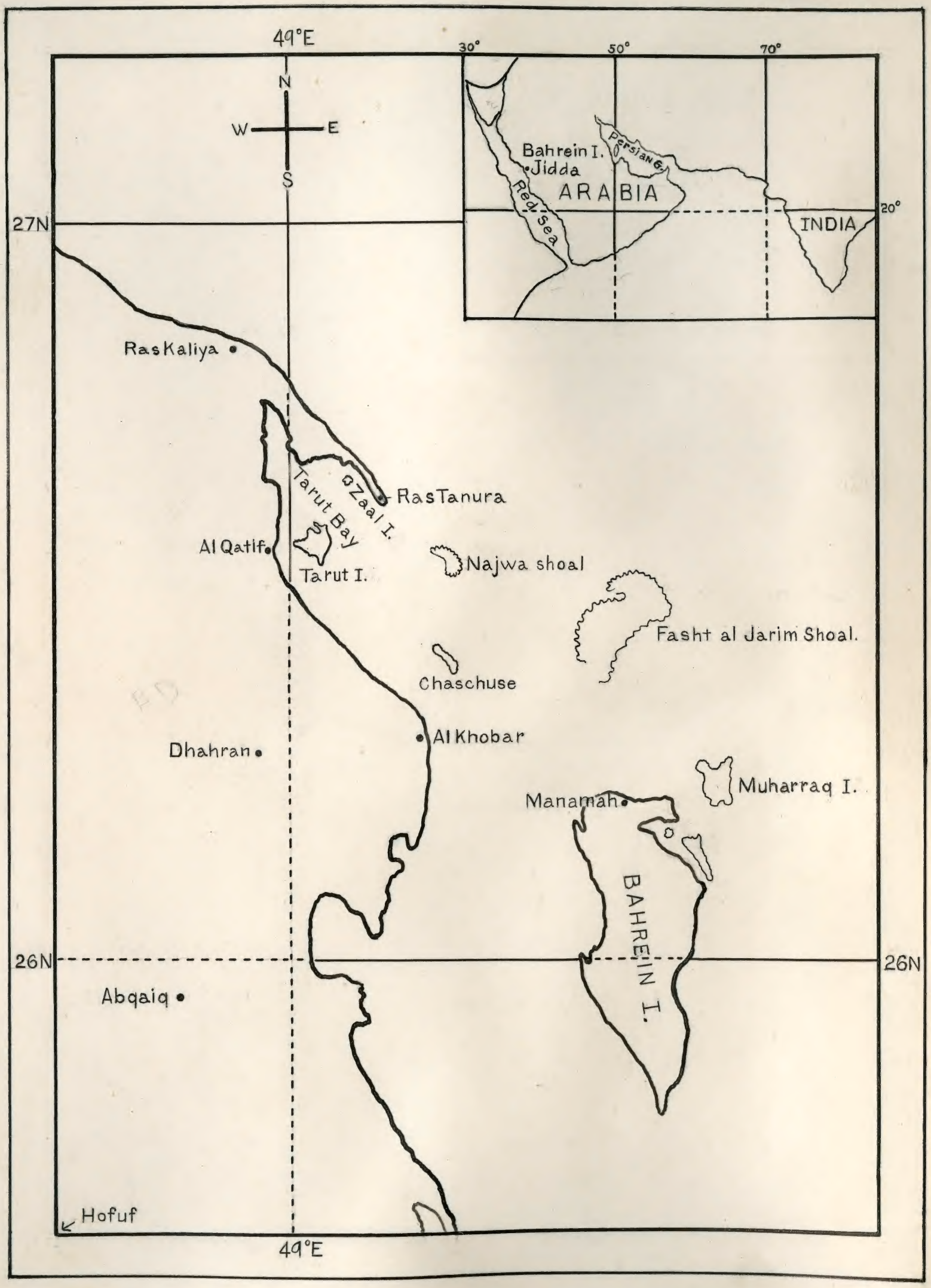

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